

# ENVIRON

170062

August 11, 2000

Mr. Mike McAteer  
Remedial Project Manager  
USEPA  
Region 5 SR-6J  
77 West Jackson Blvd.  
Chicago, IL 60604-3590

Re: Enviro-Chem Site  
Zionsville, Indiana

Dear Mr. McAteer:

In accordance with our letter to you of January 26, 2000, the Trustees have prepared a RISC analysis (as a Technical Memorandum) of the Southern Concrete Pad using the methodology provided in the *Risk Integrated System of Closure (RISC) – User's Guide*, Interim Draft (Revision 1), dated February 18, 1999. A copy of the Technical Memorandum is enclosed for your review. As you will note from the document, the Trustees believe that the post-excavation samples from the Southern Concrete Pad meet the current IDEM RCRA clean closure criteria. We intend to request a meeting with IDEM, following their review of the memorandum, to respond to any questions and/or comments.

As before, the Trustees appreciate your willingness to allow us to pursue this methodology for accelerating the completion of construction at the ECC Site. If you have any questions or concerns, please do not hesitate to call Mr. Bernstein or me.

Sincerely,

ON BEHALF OF THE ECC TRUSTEES



Roy O. Ball, Ph.D, P.E.  
Principal

cc: Mr. Norman W. Bernstein, Trustee  
Mr. Myron Waters, IDEM  
Mr. Tim Harrison, CH2M-Hill

K7  
8/00

**TECHNICAL MEMORANDUM  
CLEAN CLOSURE OF THE SOUTHERN  
CONCRETE PAD AREA  
ECC SUPERFUND SITE  
INDIANAPOLIS, INDIANA**

**Prepared by:  
ENVIRON International Corporation  
650 Dundee Road, Suite 150  
Northbrook, Illinois 60062**

**Prepared for:  
Envirochem Trustees**

**August 2000**

## INTRODUCTION

The requirements for excavation of the soils underlying the Southern Concrete Pad (SCP) of the Environmental Conservation and Chemical Corporation (ECC) Superfund Site are set forth in Section 2.1.1 and Appendix F of Revised Exhibit A<sup>1</sup>. Paragraph 5.3 of Appendix F specifies that the "then current IDEM RCRA clean closure criteria will be established for this site using the then current IDEM RCRA clean closure regulations and guidance." The "current IDEM RCRA clean closure regulations and guidance" is IDEM's Risk Integrated System of Closure<sup>2</sup> (RISC).

RISC provides both a risk-based default approach applicable to all sites and a flexible approach, which includes site-specific data and/or alternate models for site closure, for all IDEM remediation programs (including RCRA). The purpose of this Technical Memorandum is to compare the results of the SCP exit sampling (collected in accordance with Paragraphs 2 and 3 of Appendix F) to the provisions of RISC that apply to IDEM RCRA clean closure.

## SCP EXCAVATION AND SAMPLING

A location map for the ECC Superfund Site is provided as Figure 1 and a Site base map is provided as Figure 2. The excavation of the soils underlying the SCP took place during the summer of 1998. The minimum limits of excavation were the lateral extent of the concrete pad and a minimum depth of nine feet. The maximum limits of excavation were defined in Revised Exhibit A<sup>3</sup>. The actual limits of excavation were determined by visual inspection or by field screening<sup>4</sup>.

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<sup>1</sup> Revised Exhibit A, May 7, 1997, Revision 2.

<sup>2</sup> RISC is described in the User's Guide, Draft (Revision 1), dated February 18, 1999 and in the Technical Resource Guidance Document, Draft (Revision 1), dated February 18, 1999.

<sup>3</sup> The maximum safe depth was defined based on the recommendation of an independent Indiana-registered engineer specializing in geotechnical engineering (p. 4 of Revised Exhibit A). The maximum lateral extent of the excavation was defined in Appendix F of Revised Exhibit A as the top of the bank of Unnamed Ditch to the east, the road to Northside Landfill to the south, the western fence bordering the support zone to the west, and the edge of the concrete pad to the north.

<sup>4</sup> Revised Exhibit A, May 7, 1997, Revision 2, p. 2

Post excavation confirmatory soil samples (Confirmation Samples) were collected from the bottom and sidewalls of the open excavation in June and July of 1998 in accordance with Paragraphs 2 and 3 of Appendix F to Revised Exhibit A. Sample locations are shown in Figure 3. Sidewall samples were generally collected at a depth of one-half the total excavation depth. The Confirmation Samples were analyzed for Volatile Organic Compounds (VOCs) and Semivolatile Organic Compounds (SVOCs) using USEPA's Methods 8260A and 8270B, respectively.

### **GEOLOGY AND HYDROGEOLOGY OF THE SCP**

The uppermost aquifer below the SCP is a sand and gravel unit, the top of which is present between 14 to 30 feet below ground surface (bgs). This aquifer is overlain by a low permeability till (clay to silty clay with sand) that creates a confined condition for subsurface water in the underlying sand and gravel. Figures 4 through 7 provide geological cross sections for the SCP. As shown in Figures 4 and 5, the till is thinner on the north end of the SCP (approximately 14 to 20 feet thick), but is continuous vertically. On the south end of the SCP, the till is thicker (approximately 30 feet thick), but contains horizontally discontinuous sand and gravel lenses. These lenses are generally present in the lower portion of the till. Figures 6 and 7 show that the thickness of the till does not vary significantly from east to west.

Due to the low permeability of the overlying till, subsurface water is present in the sand and gravel unit under confined conditions, meaning that the potentiometric surface (the elevation to which water will rise in a well that penetrates the unit) is higher in elevation than the top of the sand and gravel unit<sup>5</sup>. The potentiometric surface, as denoted with an inverted triangle in Figures 4 through 7, is located within the till. The difference between a confined and an unconfined aquifer is illustrated in Figure 8. Because the potentiometric surface of a confined aquifer is located at a higher elevation than the top of the aquifer, the hydraulic pressure forces ground water upwards. A confined aquifer is commonly described as existing under artesian conditions. Clearly, the permeability of

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<sup>5</sup> R. Allen Freeze and John A. Cherry, *Groundwater*, 1979, Prentice-Hall, Inc., pp. 48-49.

surficial geologic units and whether the uppermost aquifer is confined or unconfined has significant implications for the migration of contamination from soil to ground water<sup>6</sup>.

In an unconfined shallow aquifer, soil contamination in the vadose zone partitions into infiltrating rain water (leachate) and is transported due to gravity through the vadose zone to the water table, where the leachate commingles with ground water. The infiltration process is also referred to as advection. Other transport phenomena also occur in the soil, such as dispersion (caused by advection) and molecular diffusion, but they are minor compared to advection, which is the primary transport mechanism for transport of soil contamination in the vadose zone into a shallow, unconfined aquifer. This geological configuration represents a significant potential for ground water contamination.

In contrast, a confined shallow aquifer is, by definition, below an overlying low-permeability unit. The combination of an overlying low permeability unit and the upward (artesian) pressure of the underlying ground water is a significant barrier to downward contaminant transport via advection. In the absence of advection, the only significant transport phenomenon to carry soil contamination to ground water is molecular diffusion.

The unconfined aquifer scenario, since it represents the "worst-case" geology for ground water contamination, forms the basis of the analysis of the migration to ground water pathway in many risk-based site assessment methodologies, including the USEPA's Soil Screening Level (SSL) Guidance<sup>7</sup> and the American Society for Testing and Materials (ASTM) Guidance for Risk-Based Corrective Action at Petroleum Release Sites<sup>8</sup>. RISC has adopted the USEPA's SSL equations for the calculation of indirect contact remediation objectives. The SSL equations describe the partitioning of organic contaminants from the organic matter associated with soil into infiltrating rainwater and the dilution that occurs upon mixing of the leachate with the ground water. In other

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<sup>6</sup> R.C. Berg, J.P. Kempton, and K. Cartwright, Potential for Contamination of Shallow Aquifers in Illinois, Illinois State Geological Survey, Circular 532, 1984.

<sup>7</sup> USEPA, Soil Screening Guidance: User's Guide (April 1996) and Technical Background Document (May 1996).

<sup>8</sup> Standard Guide for Risk-Based Corrective Action at Petroleum Release Sites, ASTM E 1739-95, November 1995.

words, the SSL conceptual model is based on an unconfined, or water table, aquifer. The SSL User's Guide describes the applicability of the SSL migration to ground water equations<sup>9</sup>:

"The methodology for developing SSLs for the migration to ground water pathway was designed for use during the early stages of a site evaluation when information about subsurface conditions may be limited. Hence, the methodology is based on rather conservative, simplified assumptions about the release and transport of contaminants in the subsurface (Exhibit 12<sup>10</sup>). These assumptions are inherent in the SSL equations and should be reviewed for consistency with the conceptual site model (...) to determine the applicability of SSLs to the migration to ground water pathway."

The SSL conceptual model is thus appropriate for Tier 1 analyses where site-specific geology may be unknown. The model assumptions need to be reconsidered if a site-specific Tier 3 analysis is to be conducted. Because the ECC site-specific geology and hydrogeology are not consistent with the SSL/RISC model assumptions, an alternative site-specific model is needed to determine the potential impact of soil contamination on ground water. \*

Some of the simplifying assumptions presented in Exhibit 12 that are not applicable to the SCP are:

- Uniformly distributed contamination from the surface to the top of the aquifer;
- Unconfined, unconsolidated aquifer with homogeneous and isotropic hydrologic properties; and
- No contaminant attenuation in the aquifer.

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<sup>9</sup> USEPA, Soil Screening Guidance: User's Guide, April 1996, pp. 28-29.

<sup>10</sup> Exhibit 12 of the SSL User's Guide is provided hereto as Appendix A.

As stated above, the shallow aquifer in the SCP is confined by an overlying low permeability till and the ground water is under upward (artesian) pressure. Therefore, soil contamination in the till can be transported to the underlying sand and gravel unit only by molecular diffusion. As a result, the alternative model must incorporate this transport mechanism (molecular diffusion), rather than advection.

### **COMPARISON OF POST EXCAVATION DATA TO RISC STANDARDS**

The lateral limits of the final excavation and confirmation sample locations are given in Figure 9. Excavation depths are depicted in cross sections in Figures 10 through 13. As stated previously, the confirmation samples were analyzed for VOCs and SVOCs. The analytical results for compounds detected above the reported quantitation limits (the Confirmation Data) are presented in Table 1. In this section, the Confirmation Data are compared to the provisions of RISC that apply to IDEM RCRA clean closure.

IDEM RCRA clean closure is defined in RISC<sup>11</sup> as:

“Addressing a unit that includes the decontamination, treatment and/or removal of all hazardous waste, hazardous waste constituents, hazardous constituents, leachate, contaminated run-on and run-off, waste decomposition products, liners, and contaminated soils (including ground water) that pose a substantial present or potential threat to human health or the environment. This may be achieved by obtaining closure levels less than or equal to PQLs (practical quantitation limits) for organic constituents, the mean plus two standard deviations of background for non-organics, and/or RISC Tier 1, 2, and 3 residential levels.”

While Tier 2 and 3 remediation objectives are acceptable, certain restrictions apply<sup>12</sup>:

“Tier 1 Residential closure levels are now accepted by OSHWM (Office of Solid and Hazardous Waste Management) as levels indicative of clean closure. In addition, Tier 2 and Tier 3 risk assessments utilizing residential exposure

<sup>11</sup> RISC User's Guide, Draft (Revision 1), February 18, 1999, p. 2-7.

<sup>12</sup> RISC User's Guide, Draft (Revision 1), February 18, 1999, p. 2-3.

assumptions may be used to achieve clean closure, however, "exposure-prevention" methods will necessitate post-closure requirements. Exposure-prevention methods cannot be used to demonstrate clean closure."

Exposure prevention remedies are achieved through either:

1. Activity restrictions, which prohibit activities that could result in exposure to contaminants at levels unsafe for human health or the environment, or
2. Engineering controls, which are physically designed to prevent humans or environmental receptors from having contact with, or exposure to, contaminated media<sup>13</sup>.

In the terminology of RISC, therefore, the requirements of IDEM RCRA clean closure are met by achieving residential Tier 1, 2, or 3 remediation objectives without reliance upon "activity restrictions" or "engineering controls" to limit exposure to residual contamination. "Closure" may be demonstrated in one of two ways<sup>14</sup>:

1. Every sample analysis result must be below the land use specific closure level established for each contaminant, or
2. The 95% upper confidence limit of the mean for the sample analyses must be below land use specific closure levels.

As a screening procedure, the maximum detected concentrations of VOCs and SVOCs were compared to RISC Residential Tier 1 Risk-Based Screening Levels (RBSLs) in Table 2. For all of the SVOCs, and for 12 of the 25 of the VOCs, the maximum detected value is below the Residential Tier 1 levels. Therefore, these compounds can be eliminated from further consideration. For the remaining 13 compounds, the 95% upper confidence limits of the mean (the "95% UCL") are compared in Table 3 to their

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<sup>13</sup> RISC Technical Resource Guidance Document, Interim Draft (Revision 1), February 18, 1999, pp. 4-7 to 4-8.

<sup>14</sup> RISC Technical Resource Guidance Document, Interim Draft (Revision 1), February 18, 1999, p. 11-5.

respective Residential Tier 1 level<sup>15</sup>. The Tier 1 RBSLs for both the direct and the indirect contact pathways are shown. RISC considers the following exposure pathways in the calculation of direct contact closure levels:

- Direct contact with skin (dermal absorption);
- Inhalation of soil particulates or dust (ingestion/inhalation);
- Volatilization to ambient air (inhalation); and,
- Direct ingestion.

The indirect contact closure levels are based on the pathway of migration to ground water, with either the Maximum Contaminant Level (MCL), if available, as the target ground water concentration, or a risk-based level which considers ingestion, inhalation, and dermal contact.

As shown in Table 3, none of the 95% UCL for the 13 remaining VOCs are in excess of their respective direct contact Tier 1 level. The 95% UCL for nine of the VOCs exceeds its respective indirect contact Tier 1 level. These compounds will be carried over for comparison with land use specific closure levels.

### **INDIRECT CONTACT TIER 3 ANALYSIS**

As discussed in the Geology and Hydrogeology section above, the SSL/RISC conceptual model for calculating site-specific remediation objectives for the indirect contact (i.e., pathway of migration to ground water) is not appropriate for this site. Therefore, a Tier 3 assessment has been conducted<sup>16</sup>. The processes modeled in the Tier 3 assessment for migration of soil contamination to the confined sand and gravel unit considers only molecular diffusion (as a transport mechanism) through the saturated till to the underlying aquifer. Biological decay is also included in the model. The site-specific

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<sup>15</sup> For the calculation of the 95% UCL, the non-detects for the VOCs are assigned the quantity of one-half of the detection limit.

<sup>16</sup> The conduct of a Tier 2 analysis, while helpful since it allows site-specific parameters, does not address the fundamental difference the SCP and the SSL/RISC conceptual model. RISC specifically requires the use of Tier 3 analysis (as was done here for the SCP) under such circumstances (RISC Technical Resource Guidance Document, Interim Draft (Revision 1), February 18, 1999, pp 9-1.

model also incorporates several assumptions that are also used in the SSL/RISC model, such as: infinite source (i.e., constant concentration over time); steady state concentration distribution; instantaneous and linear equilibrium soil/water partitioning; unconfined and unconsolidated aquifer with homogenous and isotropic hydrologic properties; receptor well at the downgradient edge of the source and screened within the plume; and, no contaminant attenuation in the aquifer. In addition, the site-specific model assumes a minimum separation of three feet of till between the confirmation samples and the underlying subsurface water, based on site-specific data.<sup>17</sup> The equations for the Tier 3 transport model and the derivation of the dilution factor for indirect contact are provided in Appendix C.

## **CONCLUSION**

The 95% UCLs of the mean for the nine remaining VOCs are compared with their respective clean closure levels in Table 4. For all compounds, the 95% UCL is less than the calculated Tier 3 closure level. The residual contamination in the SCP, therefore, achieves IDEM RCRA clean closure by meeting the RISC requirements for a residential property without reliance upon exposure prevention remedies, i.e., activity restrictions or engineering controls. Thus, a comparison of the SCP exit sampling results to the provisions of RISC that apply to IDEM RCRA clean closure demonstrates that clean closure has been achieved at the SCP.

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<sup>17</sup> This is based upon soil borings advanced at the site, the logs for which are provided as Appendix B. Figures 4 through 7 depict geological cross sections based on these boring logs.

## **TABLES**

Table 1  
Excavation Confirmation Soil Data  
ECC Southern Concrete Pad

Location:	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12*	S13	S14	S15	S16	S17	S18	S19	S20*	S21	S22	S23	S24	S25	S26	S27	S28	S29	S30	
Date Collected:	6/25/98	6/25/98	6/25/98	6/25/98	6/25/98	6/25/98	6/27/98	6/27/98	6/27/98	6/29/98	6/29/98	6/29/98	7/9/98	7/9/98	7/9/98	7/9/98	7/9/98	7/9/98	7/9/98	7/9/98	7/9/98	7/15/98	7/15/98	7/15/98	7/15/98	7/29/98	7/29/98	7/29/98	7/29/98	7/29/98	7/29/98
VOCs	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Acetone		0.12								0.027	0.043	0.029																	1.9		
Benzene																										0.006					
Bromodichloromethane															0.56	0.42	0.48														
Chloroethane																										0.14	0.19	0.028	0.032		
Chloroform	0.68		0.7												0.48															0.32	
1,1-Dichloroethane			1.1		6.7			1.4	18				0.019	1.4	11	2.1	9.6			0.007						0.2		0.005	0.088	0.59	
1,2-Dichloroethane																										0.016				0.32	
1,1-Dichloroethene					0.79										5.7	0.91	1.4									0.019				0.052	
(cis) 1,2-Dichloroethene	6.1		14	1.8	6.8	1.4							0.058	21	40	6.3	11		0.01	0.01						1		0.022	0.008	2.2	
(trans) 1,2-Dichloroethene		0.022													0.86	0.83	0.43									0.1	0.022				
1,2-Dichloroethene (Total)	6.2	0.022	14	1.8	6.9	1.4							0.058	21	44	7.4	12		0.01	0.01						1	0.024	0.024	0.008	2.2	
Ethylbenzene	1.4	0.026			0.51									0.34	6.6		2.6									0.062	0.007			0.37	
Methyl ethyl ketone	2.7	0.028	2.5	2.6	3.1	2.6		2.9	1.9					2.7	3.1	2.9	3.1					2.5								1	
Methyl isobutyl ketone					1																								0.007	0.28	
Methylene chloride															0.72		1.7						3.8			0.075		0.015		3.7	
Tetrachloroethene					2.7										110	3.4	27				0.006							0.007	0.01	3.1	
Toluene	0.73	0.01			24									2.7	19	1.8	8.5		0.011	0.007	0.007					0.79	0.016			0.25	
1,1,1-Trichloroethane	3.1		2.6		43				34				0.016	0.53	580	70			0.008	0.078						0.019		0.031	0.006	2.6	
1,1,2-Trichloroethane																														0.098	
Trichloroethene					170	2		0.83					0.008		53	42	63			0.012								0.042	0.007	6.8	
Trichlorofluoromethane														6.4	11	39	3.3											0.005		0.08	
Vinyl chloride																										0.07		0.043			
m,p-Xylenes	3.1	0.04			1.1									0.71	23	0.76	9.1									0.17	0.009			0.92	
o-Xylene(s)	2	0.026												0.71	7	0.76	2.8									0.08	0.005			0.3	
Xylenes (total)	5.1	0.066			1.1									1.4	32	1.5	12									0.25	0.014			1.2	
SVOCs																															
bis(2-Ethylhexyl)phthalate		0.4						1							0.65		3.4													0.532	
Butylbenzylphthalate															1.3	0.5															
m,p-Cresols																										0.417					
1,2-Dichlorobenzene															6.5		5.8													4.162	
Diethylphthalate					6																					0.577					
Dimethyl phthalate					2.6																										
Isophorone					0.58																										
Naphthalene															0.42																
Phenol																													1.108		

Notes:  
1) Blank Cell = Compound not detected above method detection limit.  
2) \*SVOC's were not analyzed in samples S12 and S20

**Table 2**  
**Comparison of Maximum Concentration to RISC Residential Tier 1**  
**ECC Southern Concrete Pad**

VOCs	RISC Residential Tier 1 mg/kg	Maximum Detected Concentration mg/kg
Trichloroethene	0.057	170.0
Tetrachloroethene	0.058	110.0
1,1,1-Trichloroethane	1.90	580.0
Methylene chloride	0.023	3.8
(cis) 1,2-Dichloroethene	0.40	40.0
1,1-Dichloroethene	0.058	5.7
1,2-Dichloroethane	0.024	0.3
Vinyl chloride	0.013	0.1
1,1,2-Trichloroethane	0.030	0.098
1,1-Dichloroethane	5.60	18.0
Toluene	12.00	24.0
(trans) 1,2-Dichloroethene	0.680	0.9
Chloroform	0.590	0.7
Bromodichloromethane	0.630	0.56
Acetone	3.10	1.9
Ethylbenzene	13.0	6.6
Methyl ethyl ketone	10.0	3.1
Benzene	0.034	0.006
Xylenes (total)	190.0	32
1,2-Dichloroethene (Total)	2000.0	44
Trichlorofluoromethane	2000.0	39
m,p-Xylenes	2000.0	23
o-Xylene(s)	2000.0	2.8
Methyl isobutyl ketone	2000.0	1
Chloroethane	20000	0.19
<b>SVOCs</b>		
bis(2-Ethylhexyl)phthalate	300	1
Naphthalene	0.7	0.42
1,2-Dichlorobenzene	17	6.5
Isophorone	5	0.58
Diethylphthalate	450	6
Phenol	110	1.108
Butylbenzylphthalate	930	1.3
Dimethyl phthalate	2000	2.6
m,p-Cresols	2000	0.417

**Notes:**

- 1) Tier I soil concentrations are from RISC Technical Resource Guidance Document, Table A, Draft 2/18/99
- 2) Maximum concentrations that exceed the RISC Residential Tier 1 soil concentrations are shaded  
The compounds are sorted in order of the ratio of the Maximum Detected Concentration to the RISC Residential Tier 1 value.
- 3) ND - Compound not detected above method detection limit.

**Table 3**  
**Comparison of the 95% UCL of the Mean Soil Concentration to RISC Residential Tier 1**  
**ECC Southern Concrete Pad**

VOCs	RISC Residential Tier 1		SCP Data 95% UCL of the Mean mg/kg
	Direct Contact mg/kg	Indirect Contact mg/kg	
Trichloroethene	48	0.057	21.87
Tetrachloroethene	50	0.058	11.28
Methylene chloride	120	0.023	0.71
1,1,1-Trichloroethane	2,400	1.900	57.47
cis-1,2-Dichloroethene	119	0.400	6.37
Vinyl chloride	0.31	0.013	0.16
1,1-Dichloroethene	1	0.058	0.69
1,2-Dichloroethane	4	0.024	0.12
1,1,2-Trichloroethane	10	0.030	0.13
1,1-Dichloroethane	1,400	5.600	3.06
Chloroform	3	0.590	0.20
trans-1,2-Dichloroethene	190	0.680	0.22
Toluene	1,800	12.000	3.71

**Notes:**

- 1) 95% UCL values that exceed the RISC Residential Tier I Indirect Contact soil concentrations are shaded in blue.
- 2) The compounds are sorted in order of the ratio of the RISC Residential Tier 1 Indirect Contact to the SCP Data 95% UCL of the mean.

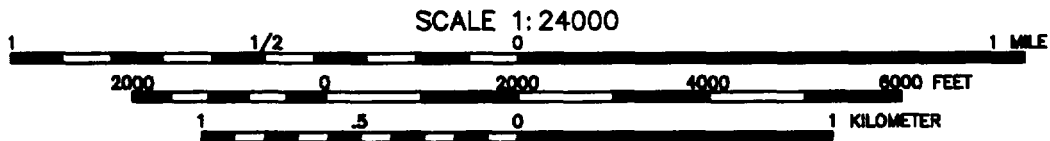
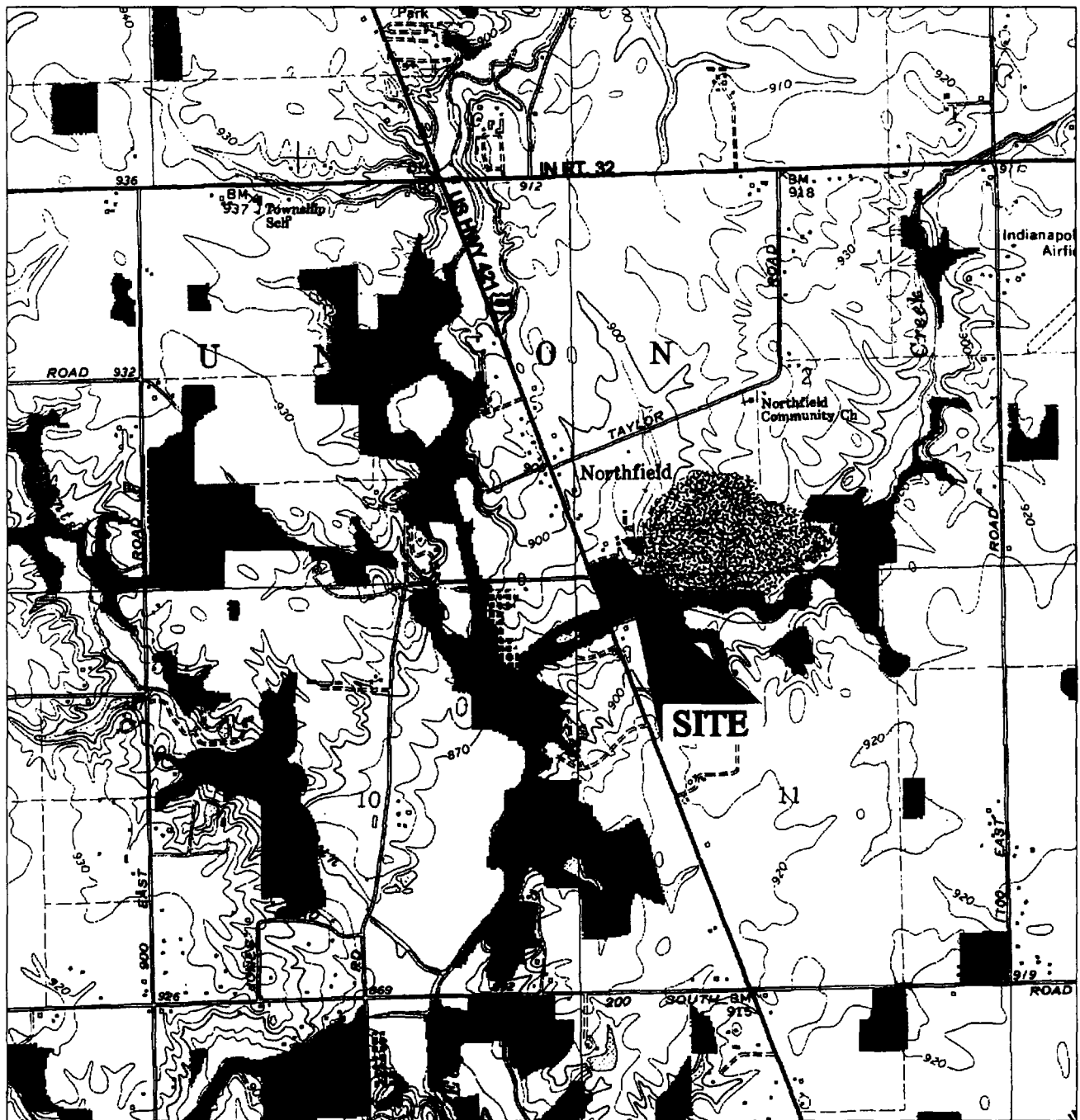
**Table 4**  
**Comparison of the 95% UCL of the Mean to Tier 3 Concentrations**  
**ECC Southern Concrete Pad**

<b>Compound</b>	<b>Calculated Tier 3 mg/kg</b>	<b>95% UCL of the Mean mg/kg</b>
Trichloroethene	23.43	21.87
cis-1,2 - Dichloroethene	22.63	6.37
Tetrachloroethane	237.18	11.28
1,1,1 - Trichloroethane	14287 [Csat]	57.47
1,1,2 - Trichloroethane	60.87	0.13
1,2 - Dichloroethane	191.17	0.12
Vinyl Chloride	836.57	0.16
1,1 - Dichloroethene	161538 [Csat]	0.69
Methylene Chloride	13000000 [Csat]	0.71

**Notes:**

- 1) Csat = Soil saturation limit.
- 2) The compounds are sorted in order of the ratio of the 95% UCL of the mean to the Calculated Tier 3 value.

## FIGURES



CONTOUR INTERVAL 40 FEET  
 DOTTED LINES REPRESENT 10-FOOT CONTOURS  
 NATIONAL GEODETIC VERTICAL DATUM OF 1929

Client Project Files\ECC\South Pad Closure\SCP Closure Final\Fig1

SOURCE: U.S.G.S. 7.5 minute series (topographic)  
 Indiana - Boone Co. 1969

**ENVIRON**

660 Dundee Road, Suite 160, Northbrook, IL 60062

**General Location Map**  
**ECC**  
**Zionsville, Indiana**

**Figure**  
**1**

Drafter: BJM

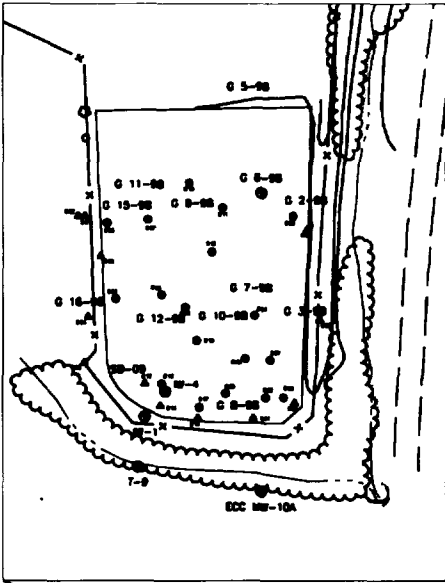
Date: 8/10/00

Contract Number: 216799

Approved:

Revised:

# EXPLODED VIEW ECC, SOUTH PAD



EXPLODED VIEW  
ECC, SOUTH PAD

## ENVIRON

650 Dundee Road, Suite 150, Northbrook, IL 60062

**SOUTH PAD LOCATION  
ECC SITE  
ZIONSVILLE, IN**

Figure  
**2**

Drafter: GTH

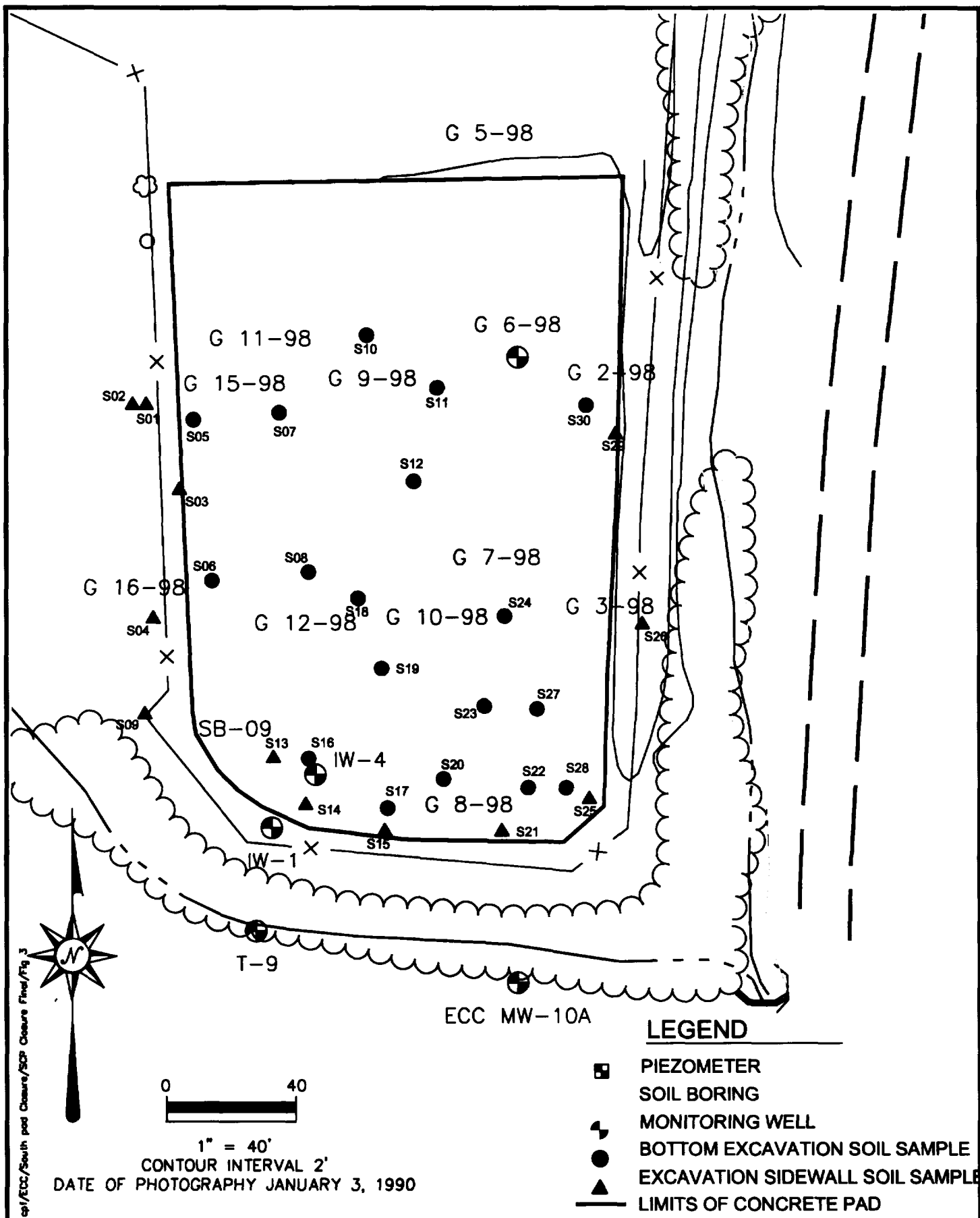
Date: 08/10/00

Contract Number:

21-6585C

Approved:

Revised:



**ENVIRON**

650 Dundee Road, Suite 150, Northbrook, IL 60062

**SAMPLING BASE MAP  
SOUTHERN CONCRETE PAD  
ECC SITE**

Figure

**3**

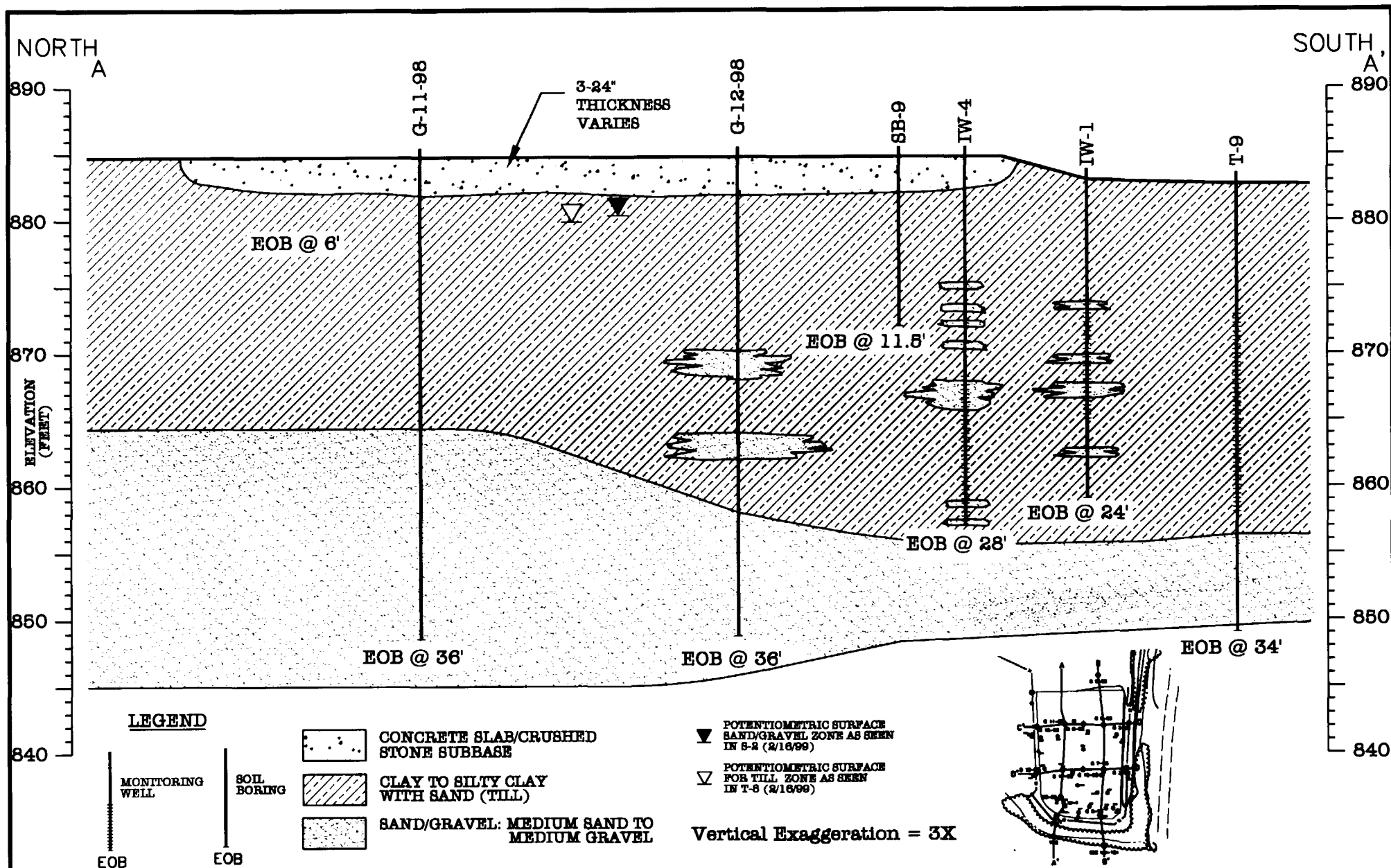
Drafter: GTH

Date: 08/10/00

Contract Number:

21-6585C

Approved: REH Revised:



**ENVIRON**

650 Dundee Road, Suite 150, Northbrook, IL 60062

**CROSS SECTION A-A'**  
NORTH TO SOUTH ON WESTERN END OF PAD  
SOUTHERN CONCRETE PAD  
ECC SITE

Figure  
**4**

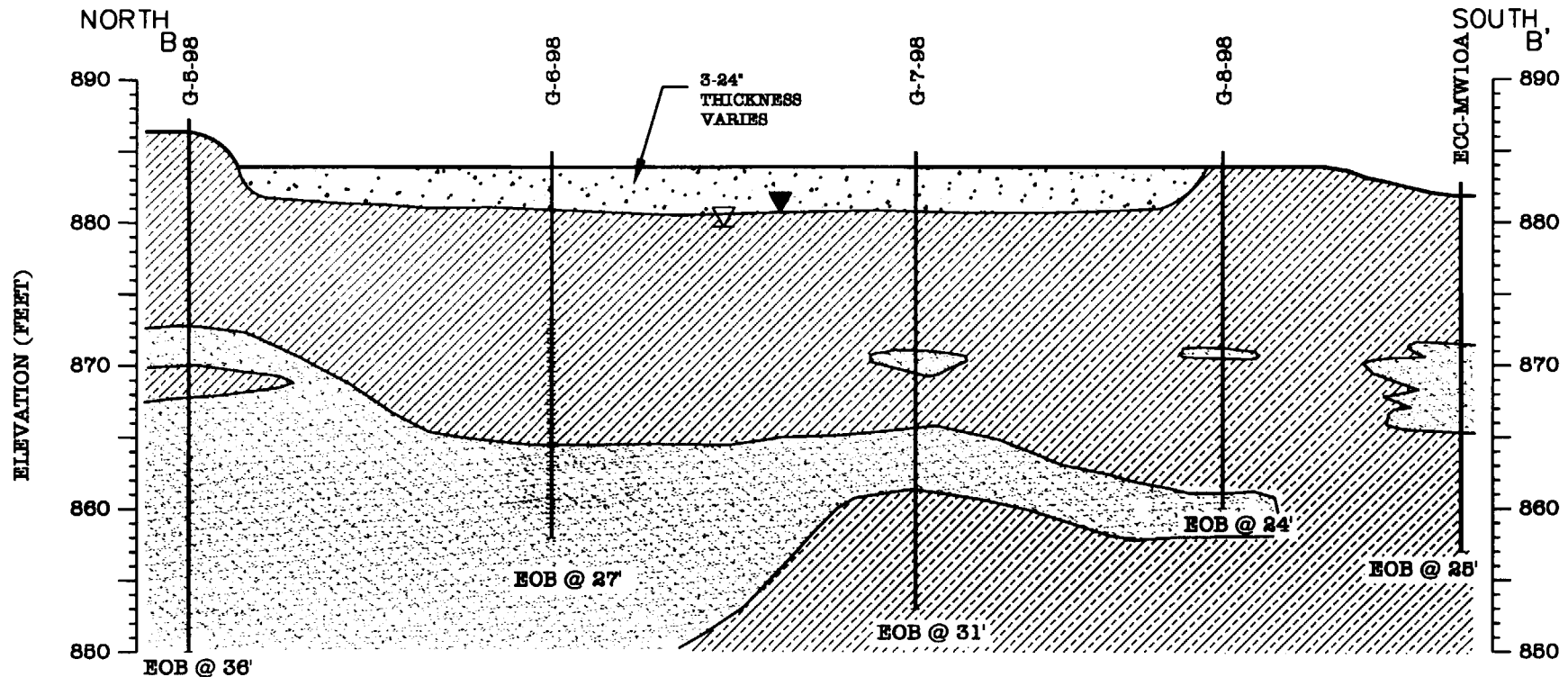
Drafter: GTH

Date: 08/04/2000

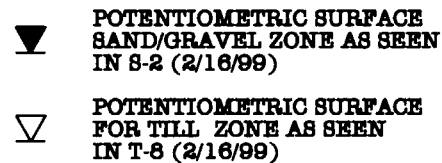
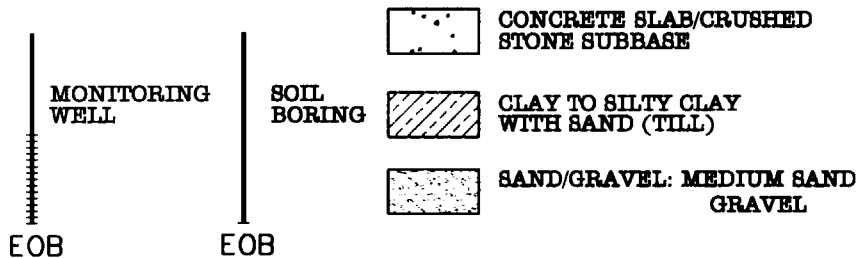
Contract Number:

21-6585C

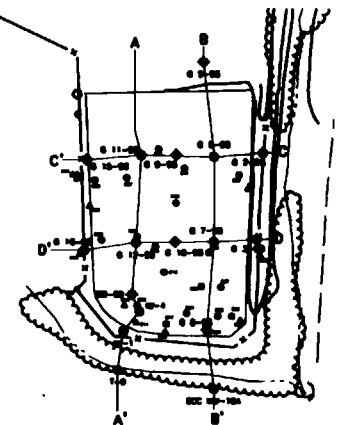
Approved: REH Revised:



### LEGEND



EXCAVATION: ELEVATION 874.550



Vertical Exaggeration = 3X

**ENVIRON**

650 Dundee Road, Suite 150, Northbrook, IL 60062

**CROSS SECTION B-B'**  
NORTH TO SOUTH ON EASTERN END OF PAD  
SOUTHERN CONCRETE PAD  
ECC SITE

Figure  
**5**

Drafter: GTH

Date: 08/10/2000

Contract Number:

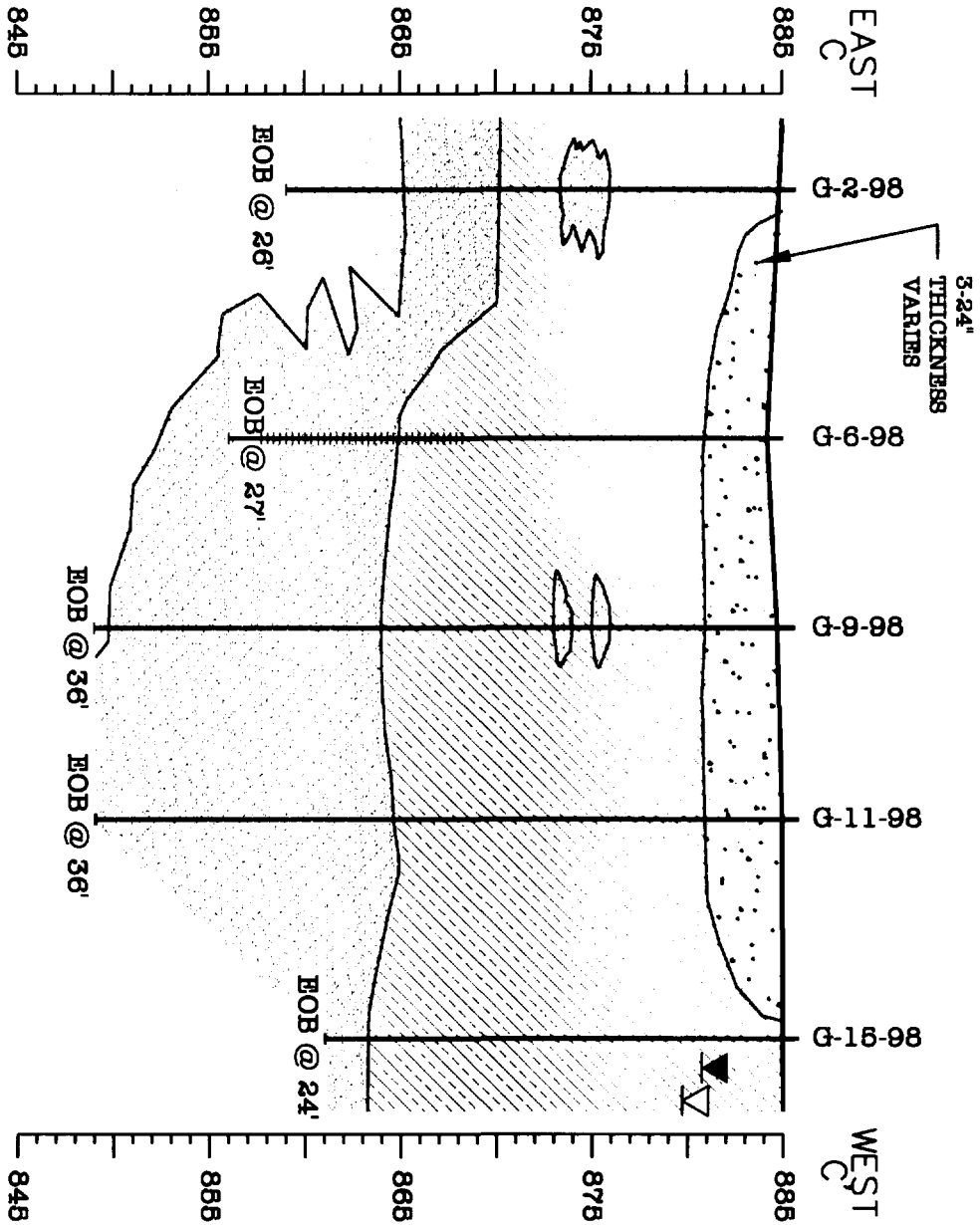
21-6585C

Approved:

REH

Revised:

# ELEVATION (FEET)



Vertical Exaggeration = 3X

CROSS SECTION C-C'

## LEGEND

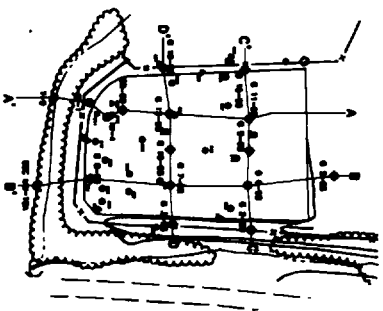
- CONCRETE SLAB/CRUSHED STONE SUBBASE
- CLAY TO SILTY CLAY WITH SAND (TILL)
- SAND/GRAVEL: MEDIUM SAND TO MEDIUM GRAVEL

MONITORING WELL

SOIL BORING

POTENTIOMETRIC SURFACE SAND/GRAVEL ZONE AS SEEN IN 8-2 (2/16/99)

POTENTIOMETRIC SURFACE FOR TILL ZONE AS SEEN IN 1-8 (2/16/99)



# ENVIRON

650 Dundee Road, Suite 150, Northbrook, IL 60062

Drafter: GTH

Date: 08/10/2000

Contract Number:

21-6585C

Approved: REH Revised:

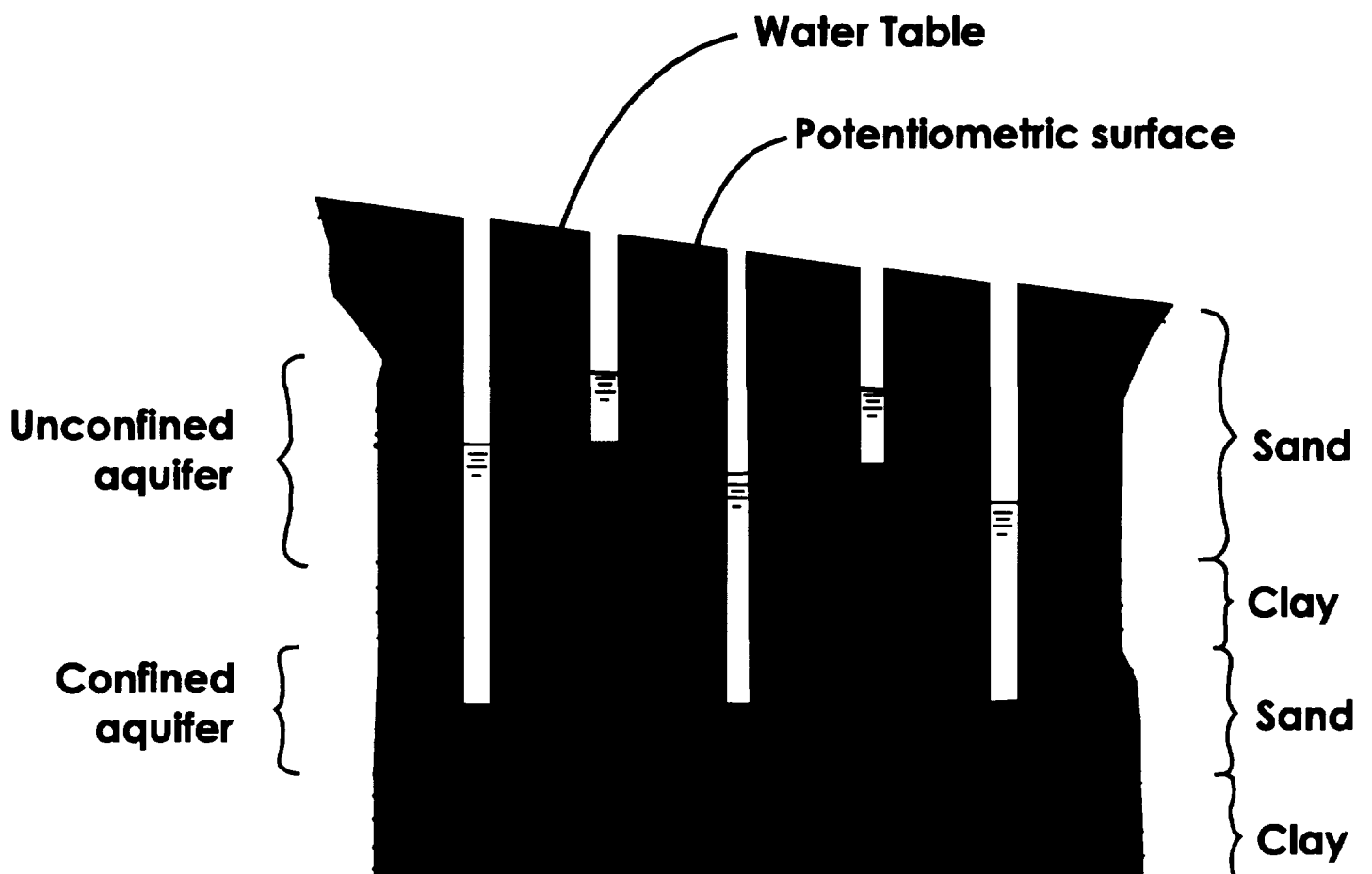
CROSS SECTION C-C'  
WEST TO EAST ON NORTHERN END OF PAD  
SOUTHERN CONCRETE PAD  
ECC SITE

Figure  
6



**Figure 8**

**Confined and Unconfined Aquifers**



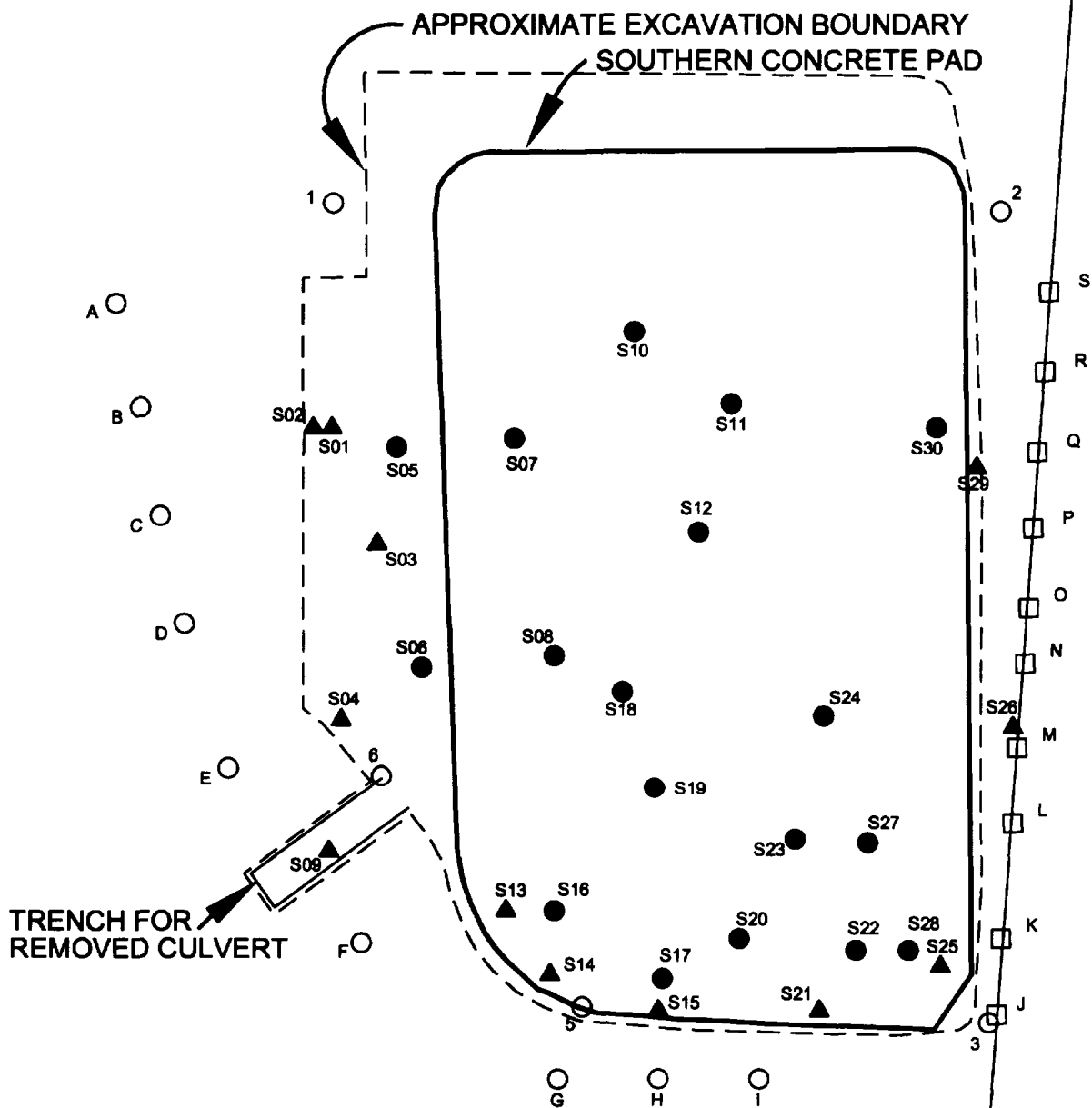
\* Adapted from R. Allen Freeze and John A. Cherry, Groundwater, (New Jersey: Prentice Hall, 1979) P. 48.

# LEGEND

- EXCAVATION BOTTOM SOIL SAMPLE
- ▲ EXCAVATION SIDEWALL SOIL SAMPLE
- GALV. FENCE POST SURVEY REFERENCE POINT
- 5/8" REBAR SURVEY REFERENCE POINT

APPROX. SCALE (ft.)

0 40



**ENVIRON**

650 Dundee Road, Suite 150, Northbrook, IL 60062

**SOIL SAMPLING LOCATIONS**  
**SOUTHERN CONCRETE PAD**  
**ECC SITE**

Figure

9

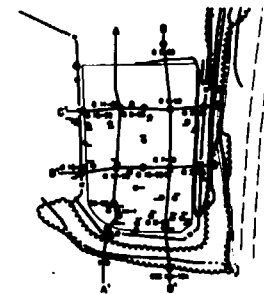
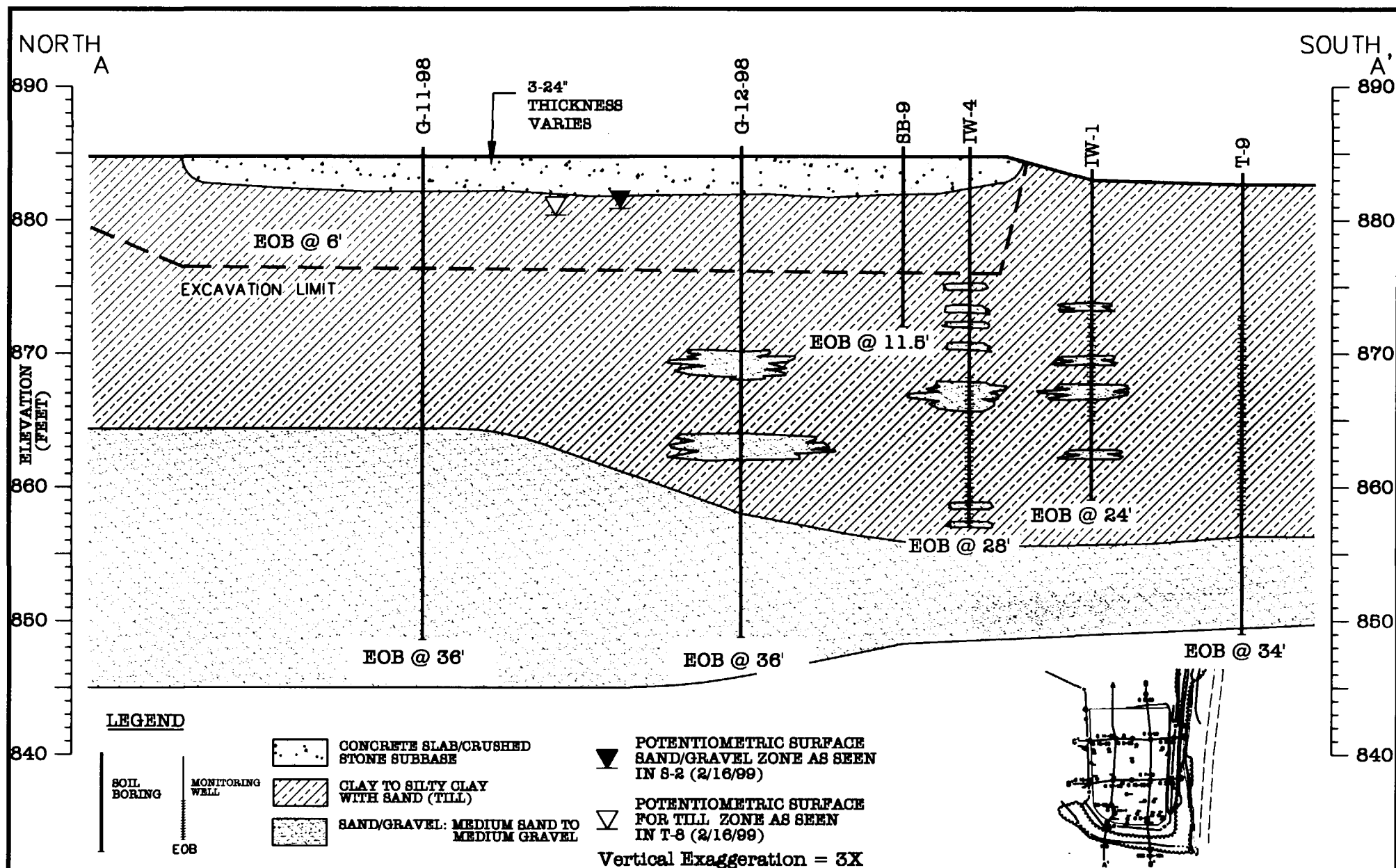
Drafter: JBP

Date: 08/10/00

Contract Number: 21-6585C

Approved: REH

Revised:



**ENVIRON**

650 Dundee Road, Suite 150, Northbrook, IL 60062

**CROSS SECTION A-A'**  
NORTH TO SOUTH ON WESTERN END OF PAD  
SOUTHERN CONCRETE PAD  
ECC SITE

Figure  
**10**

Drafter: GTH

Date: 08/10/2000

Contract Number:

21-6585C

Approved: REH Revised:

650 Dundee Road, Suite 150, Northbrook, IL 60062

**ENVIRON**

Drafter: GTH

Date: 08/10/2000

Contract Number:

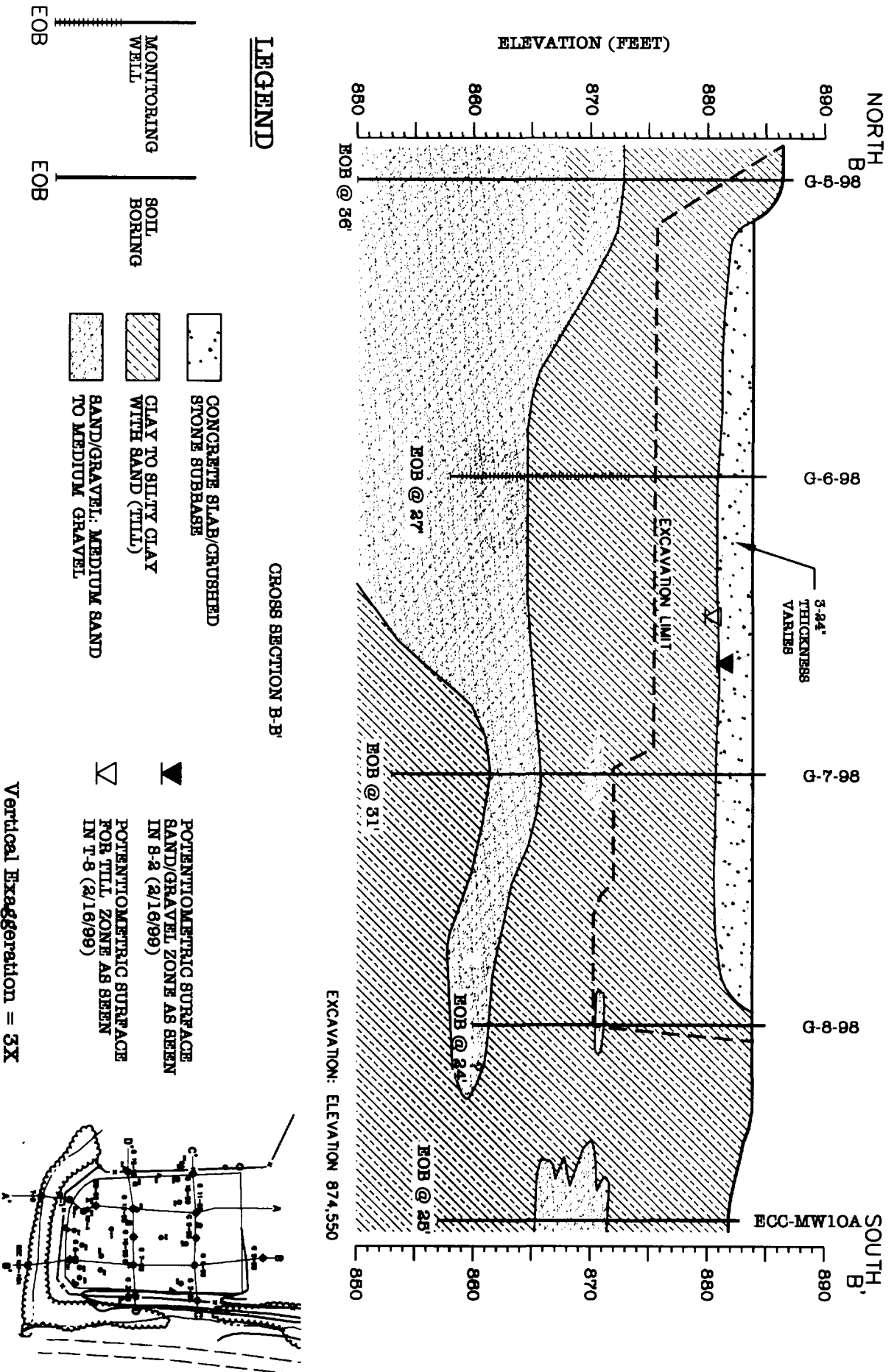
21-6585C

Approved: REH Revised:

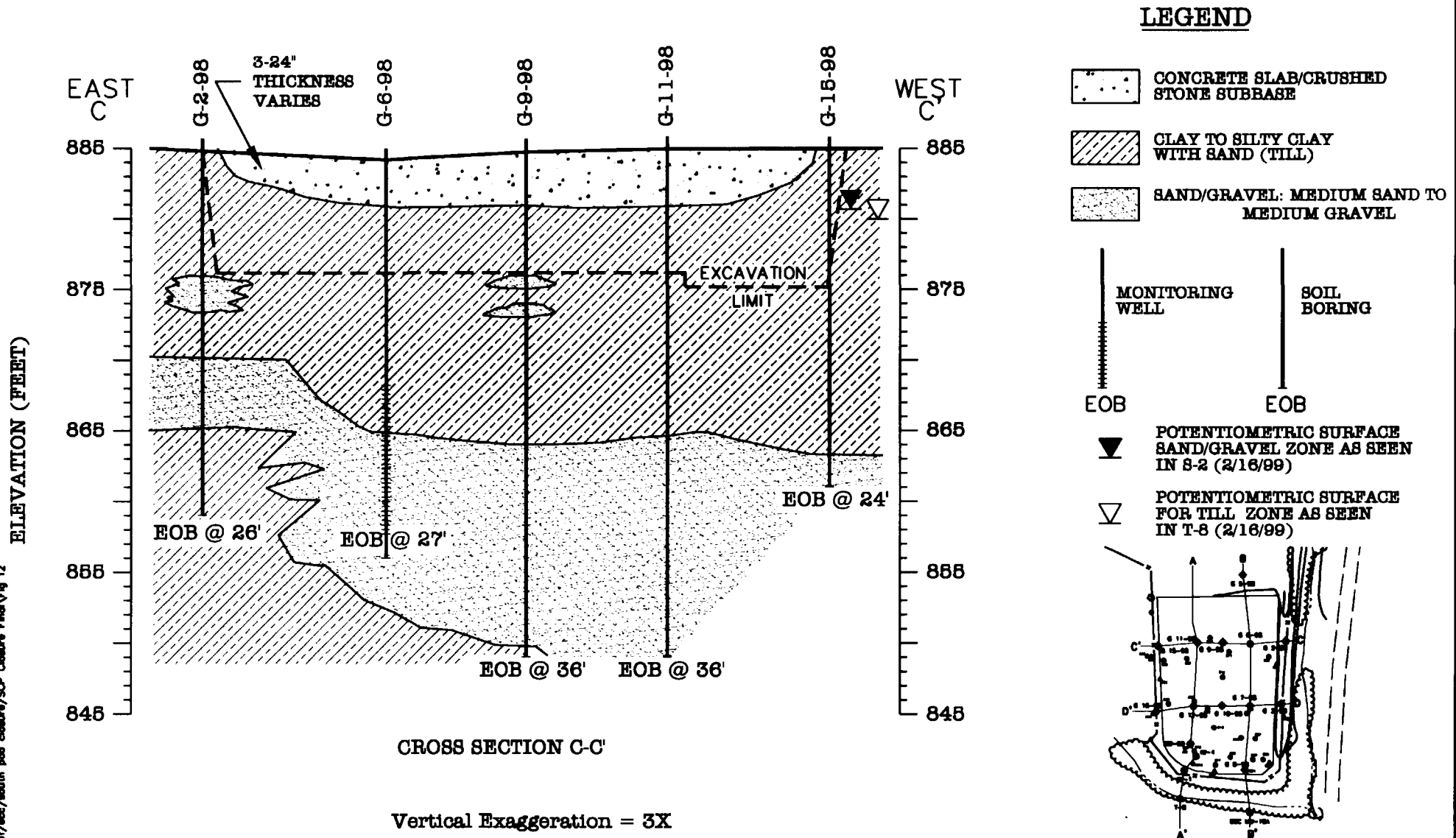
**CROSS SECTION B-B'**  
NORTH TO SOUTH ON EASTERN END OF PAD  
SOUTHERN CONCRETE PAD  
ECC SITE

Figure

11



cp/ecs/south pad closure/SCP Closure Final/Vg 12



**ENVIRON**

650 Dundee Road, Suite 150, Northbrook, IL 60062

**CROSS SECTION C-C'**  
WEST TO EAST ON NORTHERN END OF PAD  
SOUTHERN CONCRETE PAD  
ECC SITE

Figure  
**12**

Drafter: GTH





Date: 08/10/2000

Contract Number:

21-6585C

Approved: REH Revised:

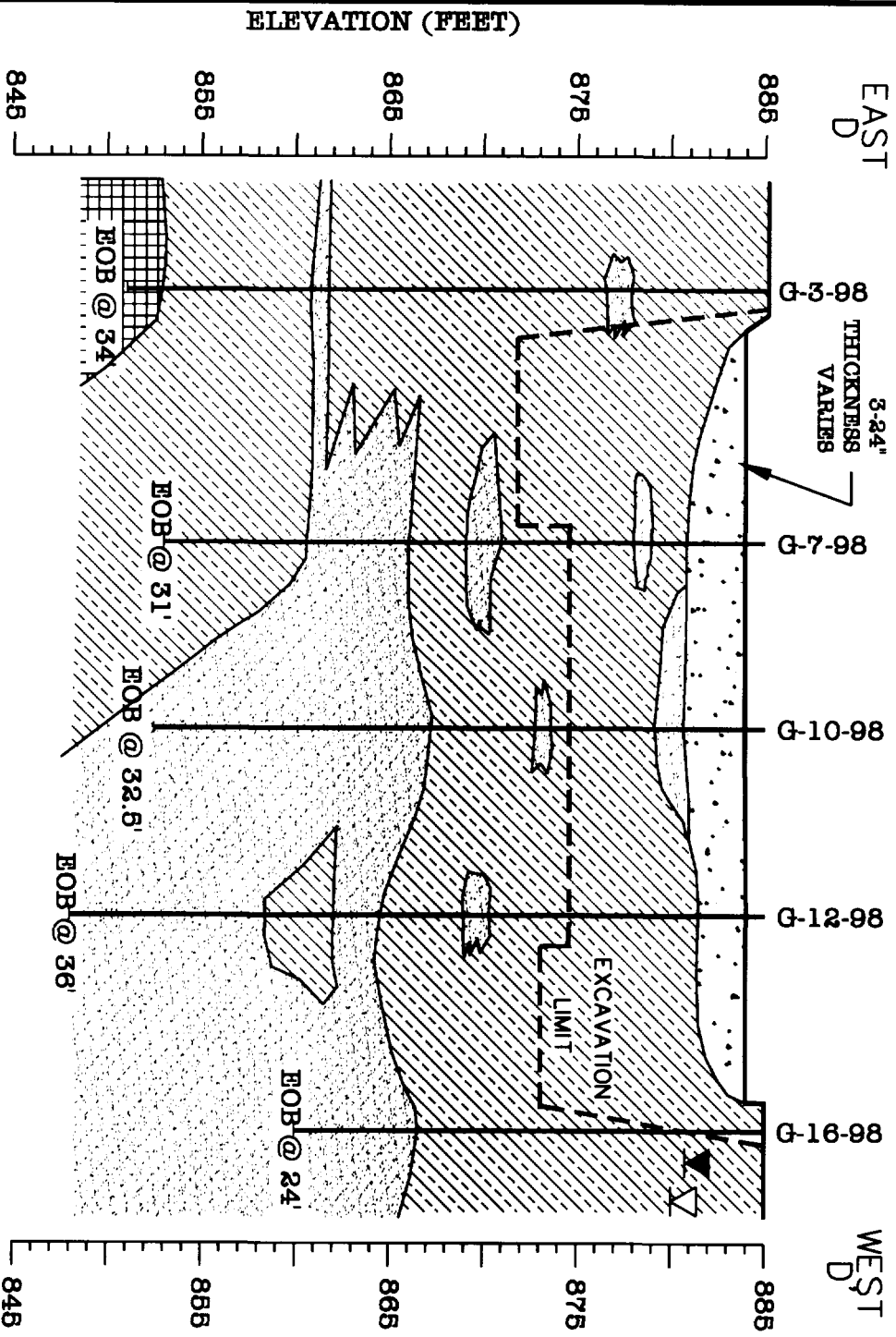
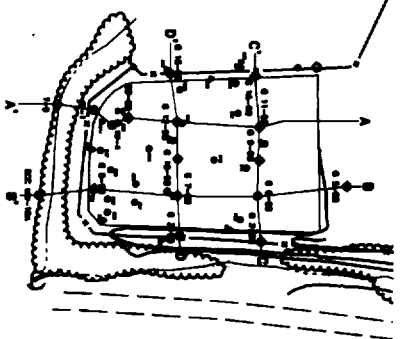
# LEGEND

-  CONCRETE SLAB/CRUSHED STONE SUBBASE
-  CLAY TO SILTY CLAY WITH SAND (TILL)
-  SAND/GRAVEL: MEDIUM SAND TO MEDIUM GRAVEL
-  SILT (ML)

SOIL BORING

EOB

POTENTIOMETRIC SURFACE  
SAND/GRAVEL ZONE AS SEEN  
IN S-2 (2/16/89)  
POTENTIOMETRIC SURFACE  
FOR TILL ZONE AS SEEN  
IN T-8 (2/16/89)



CROSS SECTION D-D'

Vertical Exaggeration = 3X

## ENVIRON

650 Dundee Road, Suite 150, Northbrook, IL 60062

Drafter: APR

Date: 08/10/2000

Contract Number: 21-6586C

Approved: REH Revised:

CROSS SECTION D-D'  
WEST TO EAST ON SOUTHERN END OF PAD  
ECC SOUTH PAD AREA  
ZIONSVILLE, IN

**APPENDIX A**

**Soil Screening Guidance  
Exhibit 12**

### **Exhibit 12: Simplifying Assumptions for the SSL Migration to Ground Water Pathway**

- Infinite source (i.e., steady-state concentrations are maintained over the exposure period)
- Uniformly distributed contamination from the surface to the top of the aquifer
- No contaminant attenuation (i.e., adsorption, biodegradation, chemical degradation) in soil
- Instantaneous and linear equilibrium soil/water partitioning
- Unconfined, unconsolidated aquifer with homogeneous and isotropic hydrologic properties
- Receptor well at the downgradient edge of the source and screened within the plume
- No contaminant attenuation in the aquifer
- No NAPLs present (if NAPLs are present, the SSLs do not apply).

## **APPENDIX B**

### **Soil Boring Logs**

Project No. 3709.001 County Boone Boring No. G-2-98 Monitor Well No. MW-G2  
 Project Name Enviro-Chem Superfund Site Site Location US 421, Zionsville, Indiana  
 Surface Elevation 885.1 Completion Depth 26.0 ft bgs Auger Depth 24 ft bgs Rotary Depth ft bgs  
 Quadrangle Rosston Sec.        T.        R.        Date: Start 1/29/98 Finish 2/4/98  
 UTM (or State Plane) Coord. N.(X) 921737.8 E.(Y) 725941.9 Water Level:         
 During Drilling 8.0 ft bgs At Completion        ft bgs

Latitude 39° 57'        Longitude 86° 16'       

Boring Location Southern Concrete Pad Excavation Area

Drilling Equipment and Method CME-75

Latitude <u>39° 57 ' "</u> Longitude <u>86° 16 ' "</u>		SAMPLES							PERSONNEL		
Boring Location <u>Southern Concrete Pad Excavation Area</u>		Graphic Log	Depth (feet bgs)	Sample No.	Sample Type	Sample Recovery (inches)	Op (tsf)	N Value (blows/6")	Moisture Content (%)	PID Reading (ppm)	Geologist - S. Conway
Drilling Equipment and Method <u>CME-75</u>											
											Helper - Justin
											Helper -
											REMARKS
Elevation	DESCRIPTION OF MATERIALS										
884.1	LEAN CLAY FILL with Sand medium stiff to stiff, brown, roots near surface (CL FILL)		1	64	X	6	.75 B	NA	15	7.3	
883.1			2	65	X	12	1.75 P	4 3 3 4	-	000	
882.1			3		X						
881.1			4	66	X	16	1.6	4 4 4 5	15	127	
880.1			5		X						
879.1	SANDY CLAY stiff, dark gray (CL)		6	150	X	20	1.4 B	2 3 4 5	21	10	12" Steel Casing installed to 7 feet.
878.1	Sand lens with pebbles at 7.3 feet.		7		X						
877.1	CLAY soft to medium stiff, gray, trace sand and gravel (CL)		8	151	X	2	0.5 P	ST	25		
876.1	POORLY GRADED SAND coarse grained, loose, gray (SP)		9		X						
875.1			10	152	X	4	NP	NA	-	NA	
874.1			11		X						Bottom of Excavation at 874.9 +/-
873.1	LEAN CLAY stiff, gray, trace sand, little gravel (CL)		12	153	X	14	1.0 E	3 5 5 7	9	0	
872.1	UW = 147 pcf		13		X						
871.1	POORLY GRADED SAND medium to coarse grained, loose, gray, trace gravel (SP)		14	154	X	14	NP	1 2 3 6	-	0	
870.1			15		X						
869.1			16	155	X	10	NP	1 3 5 5	-	0	Cc = 0.96 Cu = 7.5
868.1			17		X						
867.1	POORLY GRADED SAND with Gravel medium to coarse grained, medium dense, gray (SP)		18	156	X	18	NP	4 6 8 7	-	0	
866.1	Gravel lens at 19.8 feet		19		X						
					X						

Project No. 3709.001 County Boone

Boring No. G-2-98 Monitor Well No. MW-G2

Project Name Enviro-Chem Superfund Site

Site Location US 421, Zionsville, Indiana

Surface Elevation 885.1 Completion Depth 26.0 ft bgs

Auger Depth 24 ft bgs Rotary Depth ft bgs

Quadrangle Rosston Sec. T. R.

Date: Start 1/29/98 Finish 2/4/98

UTM (or State Plane) Coord. N.(X) 921737.8 E.(Y) 725941.9

Water Level:   
During Drilling 8.0 ft bgs At Completion ft bgs

Latitude 39° 57' 00" Longitude 86° 16' 00"

Boring Location Southern Concrete Pad Excavation Area

Drilling Equipment and Method CME-75

### DESCRIPTION OF MATERIALS

864.1  
863.1  
862.1  
861.1  
860.1  
859.1

LEAN CLAY with Sand hard, gray, trace gravel (CL)

Sand lens at 23.6 feet.

Boring terminated at 26 feet and tremmie grouted with cement-bentonite grout.

Graphic Log	Depth (feet bgs)
	21 22 23 24 25 26

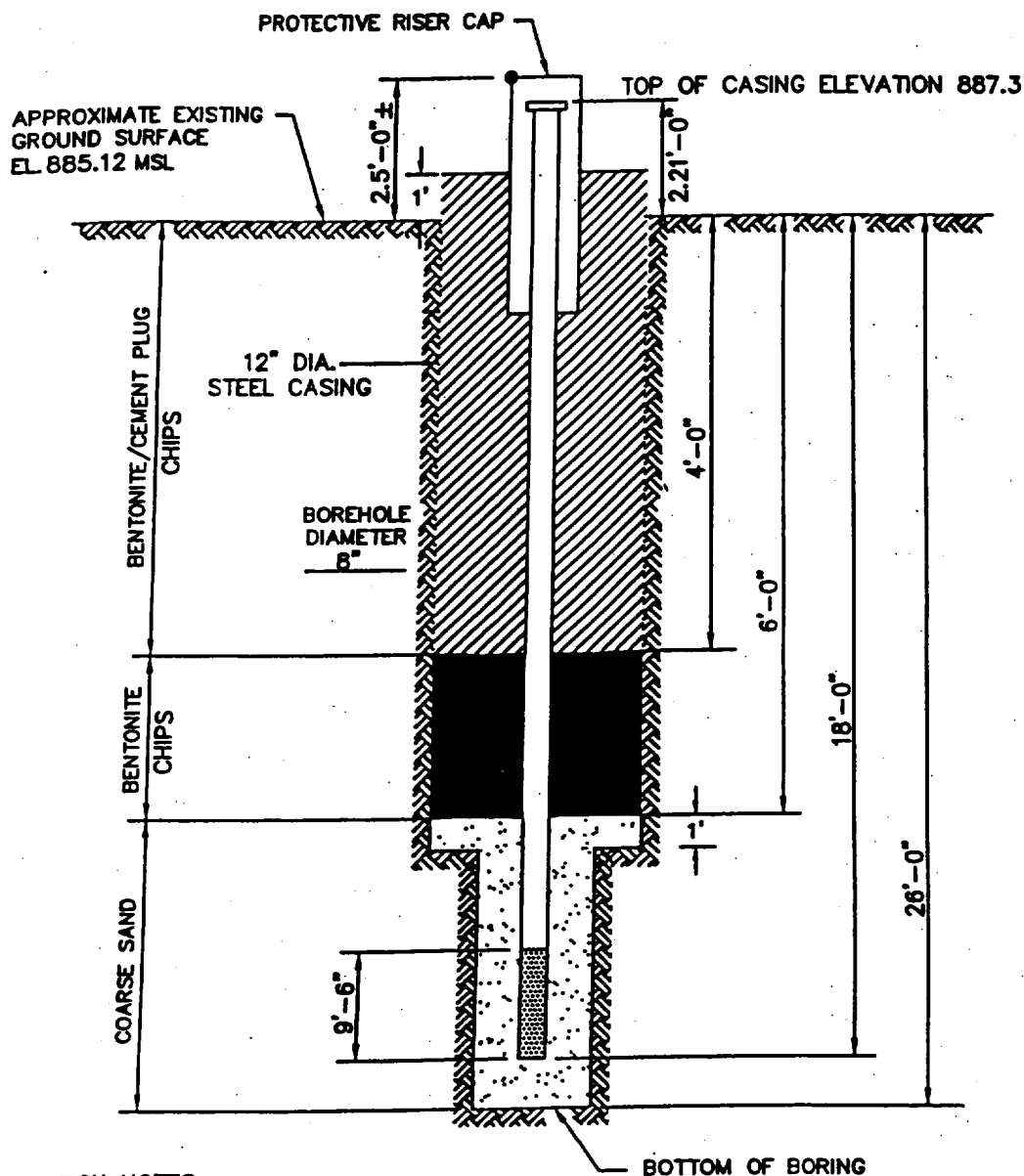
### SAMPLES

Sample No.	Sample Type	Sample Recovery (inches)	Qp (tsf)	N Value (blows/ft)	Moisture Content (%)	PID Reading (ppm)
157	X	14	6.8 B	3 8 12 21	-	0
158	X	14	4.5 + P	6 10 13 14	-	0
159	X	18	-	7 13 14 16	-	0

**PERSONNEL**  
Geologist - S. Conway  
Driller - Dave Ellis  
Helper - Justin  
Helper -

### REMARKS

PROJECT TITLE ENVIRO-CHEM WELL NO. G-2 BORING NO. G-2-98  
 LOCATION ZIONSVILLE, IN DATE STARTED 1-29-98 COMPLETED 1-29-98  
 DRILLING CONTRACTOR PHILIP ENVIRONMENTAL DRILLER DAVE ELLIS  
 RIG No. CME-75 METHOD HSA FLUIDS NONE GEOLOGIST STEVE CONWAY, HANDEX  
 COMMENTS N 921,799.89, E 725,948.40



**WELL CONSTRUCTION NOTES:**

1. TYPE RISER ABOVE W.T. 2" PVC
2. TYPE RISER BELOW W.T. 2" PVC
3. TYPE OF SCREEN 0.010" CONT. SLOT PVC
3. TYPE OF PROTECTIVE CASING STEEL
4. ELEVATION OF WATER 878.13 FT MSL
5. WATER LEVEL READING ON 9.0 FT BELOW TOC  
FEB 24, 1998

RISER STACK  
MONITORING WELL  
INSTALLATION DIAGRAM

**Versar INC.**

Project No. 3709.001 County Boone Boring No. G-3-98 Monitor Well No.

Project Name Enviro-Chem Superfund Site Site Location US 421, Zionsville, Indiana

Surface Elevation 885.2 Completion Depth 34.0 ft bgs Auger Depth 32 ft bgs Rotary Depth ft bgs

Quadrangle Rosston Sec. T. R. Date: Start 1/23/98 Finish 1/26/98

UTM (or State Plane) Coord. N.(X) 921664.5 E.(Y) 725941.5 Water Level: During Drilling 9.0 ft bgs At Completion ft bgs

Latitude 39° 57' Longitude 86° 16'

Boring Location Southern Concrete Pad Excavation Area

Drilling Equipment and Method CME-75

Elevation	DESCRIPTION OF MATERIALS	Graphic Log	Depth (feet)	San	San	San	Op	N	V	Mol	PID	REMARKS
						Rec		(blows)	Con	(ppm)		
884.2	LEAN CLAY With Sand stiff to very stiff, brown to brown and gray mottled, trace gravel and brick fragments (CL-FILL)		1	10		4	1.0 P	1 2 2 1	21	0		12" Steel Casing installed to 7 feet.  <

Project No. 3709.001 County Boone

Boring No. G-3-98 Monitor Well No. \_\_\_\_\_

Project Name Enviro-Chem Superfund Site

Site Location US 421, Zionsville, Indiana

Surface Elevation 885.2 Completion Depth 34.0 ft bgs

Auger Depth 32 ft bgs Rotary Depth ft bgs

Quadrangle Rosston Sec. \_\_\_\_\_ T. \_\_\_\_\_ R. \_\_\_\_\_

Date: Start 1/23/98 Finish 1/26/98

UTM (or State Plane) Coord. N.(X) 921664.5 E.(Y) 725941.5

Water Level: \_\_\_\_\_  
During Drilling 9.0 ft bgs At Completion 9 ft bgs

Latitude 39° 57' \_\_\_\_\_ Longitude 86° 16' \_\_\_\_\_

Boring Location Southern Concrete Pad Excavation Area

Drilling Equipment and Method CME-75

Elevation	DESCRIPTION OF MATERIALS
884.2	LEAN CLAY with Sand very stiff to hard, gray, trace gravel (CL)
883.2	Sand lens at 22 feet
882.2	
881.2	POORLY GRADED SAND medium to coarse graded, medium dense gray (SP)
880.2	LEAN CLAY with Sand very stiff to hard, gray (CL)
879.2	
878.2	
877.2	
876.2	
875.2	Grades to LEAN CLAY
874.2	
873.2	
872.2	SILT hard, gray, with interbedded clay streaks (ML)
871.2	
870.2	
869.2	
868.2	
867.2	
866.2	
865.2	
864.2	
863.2	
862.2	
861.2	
860.2	
859.2	
858.2	
857.2	
856.2	
855.2	
854.2	
853.2	
852.2	
851.2	Boring terminated at 34 feet and tremmie grouted with cement-bentonite grout.

Graphic Log	Depth (feet bgs)
	20
	21
	22
	23
	24
	25
	26
	27
	28
	29
	30
	31
	32
	33
	34

SAMPLES							PERSONNEL	
Sample No.	Sample Type	Sample Recovery (inches)	Op (tsf)	N Value (blows/6")	Moisture Content (%)	PID Reading (ppm)	Geologist -	Driller -
20		18	3.8 B	7 9 12 16	13	8.3	C. O'Neil	Dave Ellis
21		20	4.5 B	10 14 11 16		0.8	Justin	
22		20	4.4 B	10 15 20 24	11	1.3		
23		17	7.02 S	17 18 23 34	11	1.3		
24		22	10.5 S	10 21 25 47	10	2.4		
25		12	4.5 + P	20 50 50/4	12	6.1		
26		12	4.7 S	47 43 50 50/3.5	7	-		

REMARKS

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Project No. 3709.001 County Boone Boring No. G-5-98 Monitor Well No. \_\_\_\_\_  
 Project Name Enviro-Chem Superfund Site Site Location US 421, Zionsville, Indiana  
 Surface Elevation 886.6 Completion Depth 36.0 ft bgs Auger Depth 32 ft bgs Rotary Depth ft bgs  
 Quadrangle Rosston Sec. \_\_\_\_\_ T. \_\_\_\_\_ R. \_\_\_\_\_ Date: Start 1/31/98 Finish 2/5/98  
 UTM (or State Plane) Coord. N.(X) 921819.7 E.(Y) 725914.5 Water Level: \_\_\_\_\_  
 During Drilling 14.0 ft bgs At Completion \_\_\_\_\_ ft bgs  
 Latitude 39° 57' \_\_\_\_\_ Longitude 86° 16' \_\_\_\_\_  
 Boring Location Southern Concrete Pad Excavation Area  
 Drilling Equipment and Method CME-75

**DESCRIPTION OF MATERIALS**

Elevation	DESCRIPTION OF MATERIALS
885.6	POORLY GRADED SAND medium to coarse grained, medium dense, gray, trace gravel (SP)
884.6	
883.6	
882.6	
881.6	
880.6	
859.6	
858.6	
857.6	
856.6	
855.6	
854.6	
853.6	
852.6	
851.6	
850.6	

Boring terminated at 36 feet and tremmie grouted with cement-bentonite grout.

**SAMPLES**

**PERSONNEL**

Geologist - Steve Conway  
 Driller - Dave Ellis  
 Helper - Justin  
 Helper - \_\_\_\_\_

**REMARKS**

Sample No.	Sample Type	Sample Recovery (inches)	Op (tsf)	N Value (blows/ft)	Moisture Content (%)	PID Reading (ppm)
117	12	NP	3	5	7	0.0
118	13	NP	3	5	8	0.0
119	15	NP	3	7	11	0.0
120	16	NP	6	7	8	0.0
121	13	NP	3	6	9	0.0
122	16	NP	7	9	7	0.0
123	15	NP	6	8	9	0.0
124	24	NP	4	3	6	0.0

Project No. 3709.001 County Boone Boring No. G-6-98 Monitor Well No. MW-G6  
 Project Name Enviro-Chem Superfund Site Site Location US 421, Zionsville, Indiana  
 Surface Elevation 883.9 Completion Depth 27.0 ft bgs Auger Depth 25 ft bgs Rotary Depth ft bgs  
 Quadrangle Rosston Sec.        T.        R.        Date: Start 1/29/98 Finish 2/4/98  
 UTM (or State Plane) Coord. N.(X) 921433.4 E.(Y) 725907.8 Water Level:         
 During Drilling 4.0 ft bgs At Completion        ft bgs  
 Latitude 39° 57'        Longitude 86° 16'         
 Boring Location Southern Concrete Pad Excavation Area  
 Drilling Equipment and Method CME-75

### DESCRIPTION OF MATERIALS

Elevation	DESCRIPTION OF MATERIALS
882.9	7" CONCRETE above limestone subbase.
881.9	SILTY CLAY FILL gray and brown, trace sand and gravel (CL-ML FILL)
880.9	LEAN CLAY with Sand stiff to very stiff, brown to brown and gray mottled, trace gravel (CL)
879.9	
878.9	Sand lenses at 4.9 and 5.6 feet
877.9	
876.9	
875.9	
874.9	LEAN CLAY very stiff, gray, trace sand and gravel (CL)
873.9	
872.9	
871.9	UW = 143.7 pcf SG = 2.67
870.9	Grades with interbedded SAND lenses.
869.9	
868.9	Sand lens at 15.3 feet.
867.9	
866.9	
865.9	
864.9	POORLY GRADED SAND medium to coarse grained, medium dense, gray, trace gravel

Graphic Log

Depth (feet bgs)

### SAMPLES

### PERSONNEL

Sample No.	Sample Type	Sample Recovery (inches)	Op (tsf)	N Value (blows/ft)	Moisture Content (%)	PIF Reading (ppm)
67		6	-	4	15	-
68		16	-	7	11	175
69		20	2.4 S	5	12	-
160		15	2.6 B	3	13	11.0
161		18	3.0 B	4	9	1.0
162		24	1.8 ST	11	NA	
163		15	1.7	2	12	0.0
164		16	1.3	2	12	0.0
165		18	1.3	1	-	0.0
166		14	NP	3	-	0.0

Geologist - Steve Conway  
 Driller - Dave Ellis  
 Helper - Justin  
 Helper -

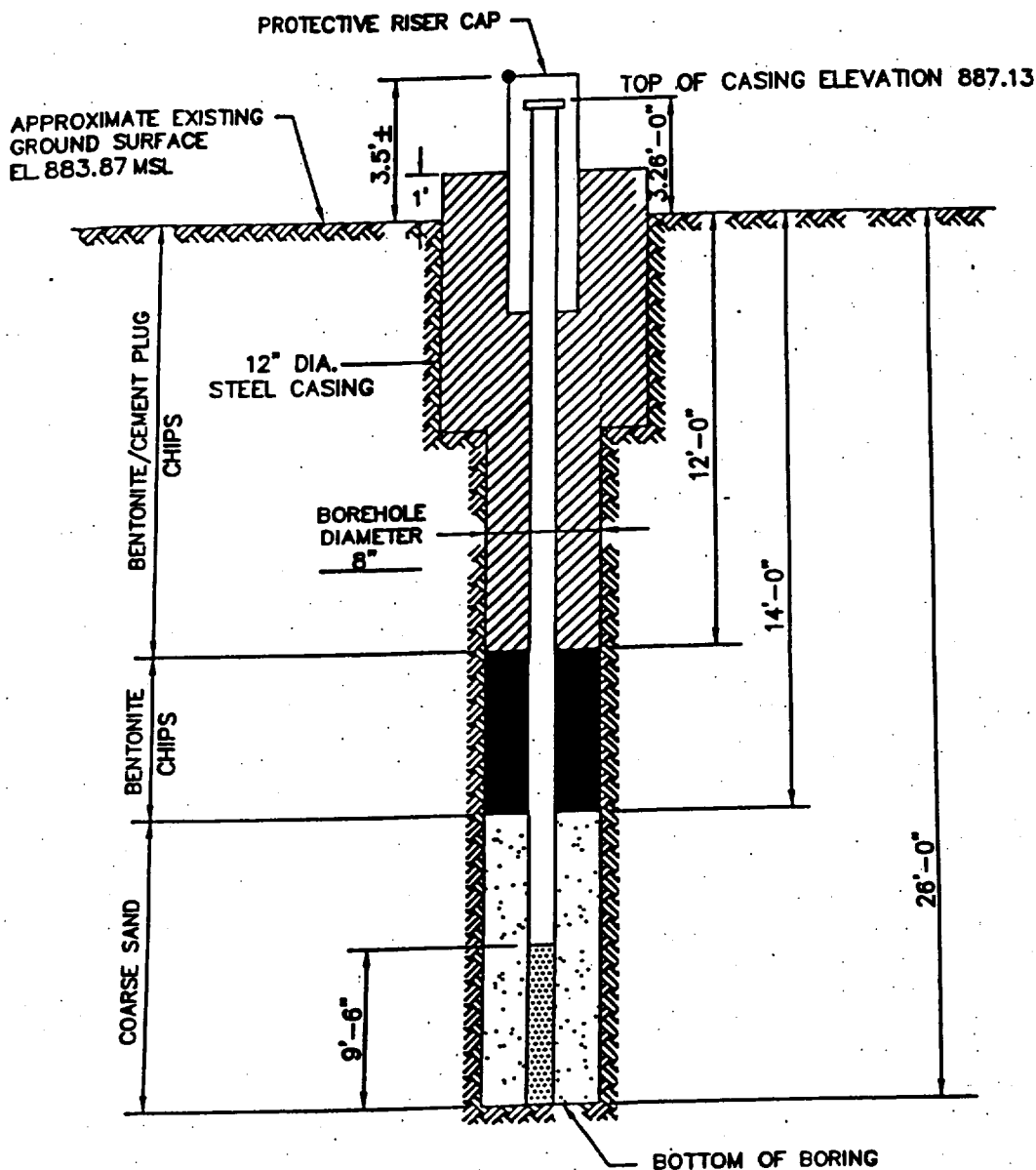
### REMARKS

12" Steel Casing installed to 7 feet.

Bottom of Excavation at 875.2 +/-

— 27

PROJECT TITLE ENVIRO-CHEM WELL NO. G-6 BORING NO. G-6-98  
 LOCATION ZIONSVILLE, IN DATE STARTED 1-29-98 COMPLETED 1-29-98  
 DRILLING CONTRACTOR PHILIP ENVIRONMENTAL DRILLER DAVE ELLIS  
 RIG No. CME-75 METHOD HSA FLUIDS NONE GEOLOGIST STEVE CONWAY, HANDEX  
 COMMENTS N 921,733.40, E 725,907.76



**WELL CONSTRUCTION NOTES:**

1. TYPE RISER ABOVE W.T. 2" PVC
2. TYPE RISER BELOW W.T. 2" PVC
3. TYPE OF SCREEN 0.010" CONT. SLOT PVC
3. TYPE OF PROTECTIVE CASING STEEL
4. ELEVATION OF WATER 878.35 FT MSL
5. WATER LEVEL READING ON 8.95' FT BELOW TOC  
FEB 24, 1998

RISER STACK  
MONITORING WELL  
INSTALLATION DIAGRAM

**Versar** INC.

NOT TO SCALE

L:\3709001\....\3709001G

**VERSAR, INC.; 200 W. 22nd Street; Suite 250; Lombard, IL 60148; 630/268-8555**

Project No. 3709.001 County Boone Boring No. G-7-98 Monitor Well No. 

Project Name Enviro-Chem Superfund Site Site Location US 421, Zionsville, Indiana

Surface Elevation 883.8 Completion Depth 31.0 ft bgs Auger Depth 29 ft bgs Rotary Depth ft bgs





Quadrangle Rosston Sec.  T.  R.  Date: Start 1/30/98 Finish 2/3/98

UTM (or State Plane) Coord. N.(X) 921668.8 E.(Y) 725903.5 Water Level:  During Drilling 18.0 ft bgs At Completion ft bgs


Latitude 39° 57' 00" Longitude 86° 16' 00"

Boring Location Southern Concrete Pad Excavation Area

Drilling Equipment and Method CME-75

Elevation	DESCRIPTION OF MATERIALS	Gravel Log	Depth (feet)	Sand 145	Sand 146	Sand 147	Sand 148	Sand 149	Rem 13	Op NP	N Value 10 12 12 9	Moisture 11	PID 0.0	REMARKS
862.8	POORLY GRADED SAND medium to coarse grained, medium dense, gray, trace gravel (CL)		21								8 5			
861.8			22											
860.8			23											
859.8	LEAN CLAY with Sand hard, gray, trace gravel (CL)		24								6 10 11 15	9	0.0	
858.8			25											
857.8			26											
856.8	Sand lenses at 29 and 29.5 feet.		27								5 11 16 19		0.0	
855.8			28											
854.8			29											
853.8	Boring terminated at 31 feet and tremmie grouted with cement-bentonite grout.		30								15 16 18 22		0.0	
852.8			31									9 13 20 28		

Project No. 3709.001 County Boone Boring No. G-8-98 Monitor Well No. \_\_\_\_\_  
 Project Name Enviro-Chem Superfund Site Site Location US 421, Zionsville, Indiana  
 Surface Elevation 884.6 Completion Depth 24.0 ft bgs Auger Depth 22 ft bgs Rotary Depth ft bgs  
 Quadrangle Rosston Sec.      T.      R.      Date: Start 1/30/98 Finish 2/5/98  
 UTM (or State Plane) Coord. N.(X) 921598.6 E.(Y) 725895.7 Water Level: \_\_\_\_\_  
 Latitude 39° 57'      " Longitude 86° 16'      " During Drilling 21.0 ft bgs At Completion 1.0 ft bgs  
 Boring Location Southern Concrete Pad Excavation Area  
 Drilling Equipment and Method CME-75

Elevation	DESCRIPTION OF MATERIALS	Gravel Log	Depth (feet)	San	San	San	Rec	Op	N	Mo	Co	PID	REMARKS
883.6	LEAN CLAY FILL with Sand soft to medium stiff, brown, trace roots and gravel (CL-FILL)		1	73	X	X	14	.4 B	1 1 2 1	16		0.0	12" Steel Casing installed to 7 feet.  

Boring No. G-8-98 Monitor Well No. \_\_\_\_\_

Site Location US 421, Zionsville, Indiana

Auger Depth 22 ft bgs Rotary Depth        ft bgs

Date: Start 1/30/98 Finish 2/5/98

**Water Level:**  
During Drilling 21.0 ft bgs At Completion 1.0 ft bgs

SAMPLES	PERSONNEL
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Core No.	Sample Type	Sample Depth (inches)	Interval	Interval Length (ft)	Interval Length (%)	Reading	Geologist - Steve Conway Driller - Dave Ellis Helper - Justin Helper -
----------	-------------	--------------------------	----------	-------------------------	------------------------	---------	---

Sample	Sample	Sample Reced	Qp (	N Vz (blow	Mols Cont	PID (	ppm	REMARKS
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complete D:\BPA\project D:\Versar project no:11un date:3/8/200

Page 1 of 2

Latitude 39° 57' Longitude 86° 16'  
Boring Location Southern Concrete Pad Excavation Area  
Drilling Equipment and Method CME-75

SAMPLES					PERSONNEL	
Sample No.	Sample Type	Sample Recovery (Inches)	Qp (tsf)	N Value (blows/ft)	Moisture Content (%)	PID Reading (ppm)
7		4	NA	-		
				7		
				12		343
8		15	4.5 P	6 7 8 9	11	284
9		16	2.5 P	2 6 5 6	11	280
27		17	4.1 B	4 6 8 7	11	
28		17	2.5 P NP	2 3 4 4	12	
29		19	NP 2.0 B	3 3 4 5	11	
30		18	1.4 B	2 4 4 6	11	
31		22	1.3 B	2 4 6 6	11	
32		16	2.2 B	3 6 7 9	11	
33		13	3.25 P	8 11 10 10	9	

Geologist - C. O'Neil

Driller - Dave Ellis

Helper - Justin

Helper -

12" Steel Casing installed to 7 feet.

Bottom off Excavation at 875.6 +/-

REMARKS

VERSAR, INC.; 200 W. 22nd Street; Suite 250; Lombard, IL 60148; 630/268-8565

Project No. 3709.001 County Boone Boring No. G-9-98 Monitor Well No. \_\_\_\_\_  
 Project Name Enviro-Chem Superfund Site Site Location US 421, Zionsville, Indiana  
 Surface Elevation 884.4 Completion Depth 36.0 ft bgs Auger Depth 34 ft bgs Rotary Depth ft bgs  
 Quadrangle Rosston Sec. \_\_\_\_\_ T. \_\_\_\_\_ R. \_\_\_\_\_ Date: Start 1/22/98 Finish 1/26/98  
 UTM (or State Plane) Coord. N.(X) 921739.4 E.(Y) 725876.6 Water Level: \_\_\_\_\_  
 During Drilling 8.0 ft bgs At Completion ft bgs  
 Latitude 39° 57' \_\_\_\_\_ Longitude 86° 16' \_\_\_\_\_  
 Boring Location Southern Concrete Pad Excavation Area  
 Drilling Equipment and Method CME-75

Latitude <u>39° 57'      "      </u> Longitude <u>86° 16'      "      </u>			SAMPLES								PERSONNEL	
Boring Location <u>Southern Concrete Pad Excavation Area</u>			Graphic Log	Depth (feet bgs)	Sample No.	Sample Type	Sample Recovery (inches)	Qp (tsf)	N Value (blows/6")	Moisture Content (%)	PID Reading (ppm)	Geologist - C. O'Neil
Drilling Equipment and Method <u>CME-75</u>												Driller - Dave Ellis
												Helper - Justin
												Helper -
REMARKS												
Elevation	DESCRIPTION OF MATERIALS											
863.4	POORLY GRADED SAND medium to coarse grained, loose to medium dense, gray, trace gravel (SP)			21	34	X	14	NP	4 4 4 7			Grain Size Analysis
862.4				22	35	X	12	NP	4 8 9 10			
861.4				23		X						
860.4	Cc = 0.49 Cu = 7.8			24	36	X	14	NP	6 8 10 10			
859.4				25		X						
858.4				26	37	X	13	NP	6 8 10 11			
857.4				27		X						
856.4				28	38	X	13	NP	4 6 10 10			
855.4				29		X						
854.4				30	39	X	14	NP	8 12 12 16			
853.4			31		X							
852.4			32	40	X	17	NP	3 9 18 21				
851.4			33		X							
850.4			34	41	X	19	NP	7 11 13 14	18			
849.4	SILT medium dense, gray, trace gravel (SM)			35		X						
848.4	Boring terminated at 36 feet and tremmie grouted with cement-bentonite grout.			36		X						

Project No. 3709.001 County Boone

Boring No. G-10-98 Monitor Well No.

Project Name Enviro-Chem Superfund Site

Site Location US 421, Zionsville, Indiana

Surface Elevation 883.8 Completion Depth 32.5 ft bgs

Auger Depth 31 ft bgs Rotary Depth Justin ft bgs

Quadrangle Rosston Sec. T. R.

Date: Start 1/28/98 Finish 2/3/98

UTM (or State Plane) Coord. N.(X) 921668.0 E.(Y) 725875.2

Water Level: During Drilling 16.0 ft bgs At Completion 0.1 ft bgs

Latitude 39° 57' Longitude 86° 16'

Boring Location Southern Concrete Pad Excavation Area

Drilling Equipment and Method CME-75

### DESCRIPTION OF MATERIALS

13" CONCRETE over limestone subbase.

882.8

881.8

880.8 CLAYEY SAND FILL brown, trace brick and gravel (SC)

879.8

878.8 LEAN CLAY medium stiff, brown, black and gray (CL)

877.8 Grades to brown.

876.8

875.8

874.8 SANDY CLAY dark brown (CL)

873.8 UW=133.1 pcf SG=2.75

872.8

871.8 SAND medium to coarse grained, medium dense, trace clay (SP)

870.8 LEAN CLAY with Sand very stiff, gray (CL)

869.8

868.8

867.8

866.8 POORLY GRADED SAND medium to coarse grained, gray (SP)

865.8

864.8

Graphic Log

Depth (feet bgs)

### SAMPLES

### PERSONNEL

Sample No.	Sample Type	Sample Recovery (Inches)	Op (tsf)	N Value (blows/ft)	Moisture Content (%)	PID Reading (ppm)
61		6	NP	-	13	121
62		15	1.0 B	5 4 3 5	17	139
63		22	.7 B	1 3 2 2	21	63
125		20	5.8 B	5 6 8 10	12	34
126		16	.85 ST	9	NA	
127		12	NP	3 6 7 6	10	6.0
128		13	3.3 B	4 5 6 6	11	2.0
129		17	3.0 B	2 4 5 6	10	5.0
130		4	NP	-	-	0
131		15	NP	2 5	-	0

Geologist - Steve Conway  
Driller - Dave Ellis  
Helper -  
Helper -

### REMARKS

12" Steel Casing installed to 7 feet.

Bottom of Excavation at 874.8 +/-

Project No. 3709.001 County Boone Boring No. G-10-98 Monitor Well No. \_\_\_\_\_  
 Project Name Enviro-Chem Superfund Site Site Location US 421, Zionsville, Indiana  
 Surface Elevation 883.8 Completion Depth 32.5 ft bgs Auger Depth 31 ft bgs Rotary Depth Justin ft bgs  
 Quadrangle Rosston Sec. T. R.  Date: Start 1/28/98 Finish 2/3/98  
 UTM (or State Plane) Coord. N.(X) 921668.0 E.(Y) 725875.2 Water Level: \_\_\_\_\_  
 During Drilling 16.0 ft bgs At Completion 0.1 ft bgs  
 Latitude 39° 57' 00" Longitude 86° 16' 00"  
 Boring Location Southern Concrete Pad Excavation Area  
 Drilling Equipment and Method CME-75

### DESCRIPTION OF MATERIALS

Elevation	DESCRIPTION OF MATERIALS
862.8	POORLY GRADED SAND medium to coarse grained, gray (SP)
861.8	
860.8	
859.8	
858.8	
857.8	
856.8	
855.8	
854.8	
853.8	
852.8	SILTY SAND to FINE SAND medium dense, gray (SM/SP)
851.8	

Boring terminated at 32.5 feet and tremmie grouted with cement-bentonite grout.

SAMPLES							PERSONNEL	
Sample No.	Sample Type	Sample Recovery (inches)	Op (tsf)	N Value (blows/ft)	Moisture Content (%)	PID Reading (ppm)	Geologist - Steve Conway	Driller - Dave Ellis
132	X	13	NP	5 4	-	0	Helper -	Helper -
133	X	16	NP	6 8 10 9	-	0		
134	X	7	NP	5 8 7 9	-	0		
135	X	12	NP	8 13 13 19	-	0		
136	X	14	NP	8 20 13 18	-	0		
	X		NP	-	-	-		

Sampler refusal at 32.5 feet.



INC. ENVIRONMENTAL RISK MANAGEMENT

## Field Boring Log

Page 1 of 2

Project No. 3709.001 County Boone Boring No. G-11-98 Monitor Well No. \_\_\_\_\_  
Project Name Enviro-Chem Superfund Site Site Location US 421, Zionsville, Indiana  
Surface Elevation 884.6 Completion Depth 36.0 ft bgs Auger Depth 34 ft bgs Rotary Depth ft bgs  
Quadrangle Rosston Sec. \_\_\_\_\_ T. \_\_\_\_\_ R. \_\_\_\_\_ Date: Start 1/22/98 Finish 1/27/98  
UTM (or State Plane) Coord. N.(X) 921739.6 E.(Y) 725846.6 Water Level: \_\_\_\_\_  
During Drilling 20.0 ft bgs At Completion 2 ft bgs  
Latitude 39° 57' \_\_\_\_\_ Longitude 86° 16' \_\_\_\_\_  
Boring Location Southern Concrete Pad Excavation Area  
Drilling Equipment and Method CME-75

Elevation	DESCRIPTION OF MATERIALS	G L	D (ft)	S	S	S	O	Z	U	E	REMARKS		
883.6	10" Concrete floor slab over 14" Crushed limestone subbase	△△△△	1	4	X	6	NA	-	21	000			
882.6	LEAN CLAY FILL with Sand very stiff, brown and gray mottled (CL-FILL)		2	5	X	10	3.5 P	4	12	31.9			
3						5	6	9					
881.6													
880.6	LEAN CLAY stiff to very stiff, gray, trace sand and gravel (CL)		4	6	X	17	2.0 P	3	10	24.5			
879.6			5				4	6	9				
878.6			6	42	13	1.7 B	4	3	2	5	11	74.8	
877.6			7		X							Steel Casing installed to 7 feet.	
876.6			8	43	23	2.9 B	3	5	7	2	11	5.0	Bottom of Excavation at 876.6 +/-
875.6			9										
874.6	UW = 145.1 pcf SG = 2.70		10	44	█	17	2.8 B	ST	12	NA			
873.6			11										
872.6			12	45	24	1.3 P	2	3	5	6	11	3.4	
871.6			13		X								
870.6			14	46	24	1.9 B	1	3	5	6	11	3.4	
869.6			15										
868.6			16	47	X	23	1.5 B	2	2	3	4	11	2.9
867.6			17										
866.6			18	48	20	1.4 B	1	2	4	5	13	2.9	
865.6	LEAN CLAY with Sand to SANDY CLAY stiff, gray (CL)		19		X								



INC. ENVIRONMENTAL RISK MANAGEMENT

## Field Boring Log

Page 2 of 2

Project No. 3709.001 County Boone Boring No. G-11-98 Monitor Well No. \_\_\_\_\_  
Project Name Enviro-Chem Superfund Site Site Location US 421, Zionsville, Indiana  
Surface Elevation 884.6 Completion Depth 36.0 ft bgs Auger Depth 34 ft bgs Rotary Depth ft bgs  
Quadrangle Rosston Sec. T. R.  Date: Start 1/22/98 Finish 1/27/98  
UTM (or State Plane) Coord. N.(X) 921739.6 E.(Y) 725846.6 Water Level: \_\_\_\_\_  
Latitude 39° 57' 00" Longitude 86° 16' 00" During Drilling 720.0 ft bgs At Completion 7 ft bgs  
Boring Location Southern Concrete Pad Excavation Area  
Drilling Equipment and Method CME-75

Elevation		DESCRIPTION OF MATERIALS	Gr	Lo	De (fe)	Sa	Sa	Sa	Re	Or	N	1/18"	-	Co	Pt	Sp	REMARKS
863.6		POORLY GRADED SAND medium to coarse grained, medium dense, gray, trace gravel (SP)  Cc = 9.0 Cu = 8.0   <															

Project No. 3709.001 County Boone

Boring No. G-12-98 Monitor Well No.         

Project Name Enviro-Chem Superfund Site

Site Location US 421, Zionsville, Indiana

Surface Elevation 884.0 Completion Depth 36.0 ft bgs

Auger Depth 34 ft bgs Rotary Depth          ft bgs

Quadrangle Rosston Sec.          T.          R.         

Date: Start 1/28/98 Finish 2/1/98

UTM (or State Plane) Coord. N(X) 921671.0 E.(Y) 725842.4

Water Level:          During Drilling 20.0 ft bgs At Completion          ft bgs

Latitude 39° 57' 00" Longitude 86° 16' 00"

Boring Location Southern Concrete Pad Excavation Area

Drilling Equipment and Method CME-75

Elevation	DESCRIPTION OF MATERIALS
883.0	7" CONCRETE over limestone FILL subbase.
882.0	LEAN CLAY FILL with Sand stiff to very stiff, brown and gray, trace gravel and brick fragments (CL-FILL)
881.0	
880.0	
879.0	
878.0	LEAN CLAY stiff to very stiff, gray, trace sand and gravel (CL)
877.0	
876.0	
875.0	
874.0	
873.0	
872.0	
871.0	
870.0	SILTY SAND to fine SAND medium dense, gray (SM/SP)
869.0	
868.0	LEAN CLAY with Sand very stiff, gray (CL)
867.0	
866.0	
865.0	

Graphic Log	Depth (feet bgs)
Δ	1
Δ	2
Δ	3
Δ	4
Δ	5
Δ	6
Δ	7
Δ	8
Δ	9
Δ	10
Δ	11
Δ	12
Δ	13
Δ	14
Δ	15
Δ	16
Δ	17
Δ	18
Δ	19

SAMPLES							PERSONNEL	
Sample No.	Sample Type	Sample Recovery (inches)	Op (tsf)	N Value (blows/ft)	Moisture Content (%)	PID Reading (ppm)	Geologist -	C. O'Neil
57		15	5.0 P	8 27 18	13	4000	Driller -	Dave Ellis
58		20	3.7 B	6 5 6 6	10	912	Helper -	Justin
59		0	-	-	-	-	Helper -	
60		24	1.2 B	3 3 5 7	9	0.8		
82		17	3.0 B	1 3 5 5	10	1.1		
83		18	2.6 B	4 5 6 9	11	0.5		
84		18	1.7 B	2 4 6 10	11	0		
85		14	NP	6 8 10 8	13	0		
86		18	3.1 B	6 4 4 6	10	0		
87		17	3.3 B	2 4 4 6	10	0		

12" Steel Casing installed to 7 feet.

Bottom of Excavation at 875.1 +/-

Project No. 3709.001 County Boone  
 Project Name Enviro-Chem Superfund Site  
 Surface Elevation 884.0 Completion Depth 36.0 ft bgs  
 Quadrangle Rosston Sec.      T.      R.       
 UTM (or State Plane) Coord. N.(X) 921671.0 E.(Y) 725842.4  
 Latitude 39° 57'      " Longitude 86° 16'      "  
 Boring Location Southern Concrete Pad Excavation Area  
 Drilling Equipment and Method CME-75

Boring No. G-12-98 Monitor Well No.       
 Site Location US 421, Zionsville, Indiana  
 Auger Depth 34 ft bgs Rotary Depth      ft bgs  
 Date: Start 1/28/98 Finish 2/1/98  
 Water Level:       
 During Drilling 220.0 ft bgs At Completion      ft bgs

### DESCRIPTION OF MATERIALS

Elevation	DESCRIPTION OF MATERIALS
863.0	SAND medium to coarse grained, loose to medium dense, gray (SP)
862.0	LEAN CLAY stiff, gray, trace sand (CL)
861.0	
860.0	
859.0	
858.0	SAND medium to coarse grained, loose to medium dense, gray (SP)
857.0	
856.0	
855.0	
854.0	
853.0	
852.0	
851.0	
850.0	
849.0	
848.0	Boring terminated at 36 feet and tremmie grouted with cement-bentonite grout.

Graphic Log

Depth (feet bgs)

### SAMPLES

### PERSONNEL

Sample No.	Sample Type	Sample Recovery (inches)	Op (feet)	N Value (blows/ft)	Moisture Content (%)	PID Reading (ppm)	REMARKS
88	X	18	NP	1 2 5 4	17	0	
89	X	12	1.2 8	2 2 4 5	14	0	
90	X	13	0.8 8	1 2 3 4		0	
91	X	12	NP	4 6 9 9		0	
92	X	20	NP	2 8 11 14		0	
93	X	21	NP	6 12 14 19		0	
94	X	15	NP	4 9 9 16		0	
95	X	13	NP	7 9 13 15		0	

Geologist - C. O'Neil  
 Driller - Dave Ellis  
 Helper - Justin  
 Helper -

Project No. 3709.001 County Boone  
 Project Name Enviro-Chem Superfund Site  
 Surface Elevation 884.6 Completion Depth 24.0 ft bgs  
 Quadrangle Rosston Sec.      T.      R.       
 UTM (or State Plane) Coord. N.(X) 921739.9 E.(Y) 725802.2  
 Latitude 39° 57'   Longitude 86° 16'    
 Boring Location Southern Concrete Pad Excavation Area  
 Drilling Equipment and Method CME-75

Boring No. G-15-98 Monitor Well No.       
 Site Location US 421, Zionsville, Indiana  
 Auger Depth 22 ft bgs Rotary Depth      ft bgs  
 Date: Start 2/11/98 Finish 2/13/98  
 Water Level:       
 During Drilling 221.5 ft bgs At Completion    ft bgs

		SAMPLES								PERSONNEL	
		Sample No.	Sample Type	Sample Recovery (inches)	Op (tsf)	N Value (blows/6")	Moisture Content (%)	PID Reading (ppm)		Geologist - Steve Conway	
										Driller - Dave Ellis	
										Helper - Justin	
										Helper -	
										REMARKS	
Elevation	DESCRIPTION OF MATERIALS	Graphic Log	Depth (feet bgs)								
883.6	LEAN CLAY with Sand hard, brown, trace gravel (CL)		1	229	24	4.5+ P	2 4 5 9	11	173		
882.6			2	230	24	4.5 P	4 6 7 9	12	342		
881.6			3								
880.6			4	231	24	4.5 P	4 7 10 6	11	50		
879.6			5								
878.6	LEAN CLAY with Sand gray, trace gravel (CL)		6	247	17	3.0	4 4 5 6	11			
877.6			7								12" Steel Casing installed to 7 feet.
876.6			8	248	19	2.1	3 4 5 5	11			
875.6			9								
874.6	SANDY SILTY CLAY gray, trace gravel (CL-ML)		10	249	24	1.2	ST	12	NP		LL = 17, PI = 5
873.6	UW = 144.8 pcf SG = 2.73		11								50% Sand
872.6	Sand lenses at 11.5 and 11.8 feet		12	250	20	1.3	4 4 4 5	11			29% Silt
871.6			13								21% Clay
870.6	Sand lens at 13.5 feet.		14	251	21	1.7	1 2 4 5	11			
869.6			15								
868.6	Sand lens at 15.9 feet.		16	252	19	1.7	2 3 3 4				
867.6			17								
866.6	SANDY CLAY stiff, gray, trace gravel (CL-SC)		18	253	24	1.7	1 1 2 2				
865.6	Sand lens at 19.5 feet.		19								

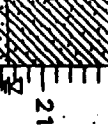

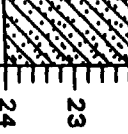
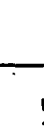
Project No. 3709.001 County Boone  
 Project Name Enviro-Chem Superfund Site  
 Surface Elevation 884.6 Completion Depth 24.0 ft bgs  
 Quadrange Rosston Sec. T. R. R.  
 UTM (or State 921739.9 E/M 725802.2  
 Plane) Coord. N.(X)

Boring No. G-15-98 Monitor Well No.   
 Site Location US 421, Zionville, Indiana  
 Auger Depth 22 ft bgs Rotary Depth  ft bgs  
 Date: Start 2/11/98 Finish 2/13/98  
 Water Level:   
 During Drilling 221.5 ft bgs At Completion 2 ft bgs

Latitude 39° 57' Longitude 86° 16'

Boring Location Southern Concrete Pad Excavation Area

Drilling Equipment and Method CME-75

Elevation	DESCRIPTION OF MATERIALS	Graphic Log	Depth (feet bgs)	SAMPLES						PERSONNEL		REMARKS
				Sample No.	Sample Type	Sample Recovery (inches)	Qp (tsf)	N Value (blows/6")	Moisture Content (%)	PID Reading (ppm)	Geologist - Steve Conway Driller - Dave Ellis Helper - Justin Helper -	
863.6	SANDY CLAY stiff, gray, trace gravel (CL-SC)		21	254		21	1.2	1				
862.6	CLAYEY SAND loose, gray, trace gravel (SC)		22	255		22	NP	W				
861.6			23					H				
860.6	Boring terminated at 24 feet and tremmie grouted with cement-bentonite grout.		24									

Project No. 3709.001 County Boone

Boring No. G-16-98 Monitor Well No. \_\_\_\_\_

Project Name Enviro-Chem Superfund Site

Site Location US 421, Zionsville, Indiana

Surface Elevation 884.8 Completion Depth 24.0 ft bgs

Auger Depth 22 ft bgs Rotary Depth ft bgs

Quadrangle Rosston Sec. \_\_\_\_\_ T. \_\_\_\_\_ R. \_\_\_\_\_

Date: Start 2/10/98 Finish 2/13/98

UTM (or State Plane) Coord. N.(X) 921672.8 E.(Y) 725803.5

Water Level: \_\_\_\_\_  
During Drilling 218.0 ft bgs At Completion 2 ft bgs

Latitude 39° 57' \_\_\_\_\_ Longitude 86° 16' \_\_\_\_\_

Boring Location Southern Concrete Pad Excavation Area

Drilling Equipment and Method CME-75

Elevation	DESCRIPTION OF MATERIALS
883.8	Crushed Limestone FILL subbase
882.8	LEAN CLAY with Sand stiff, brown to brown and gray, trace gravel and organics (CL FILL)
881.8	
880.8	
879.8	
878.8	
877.8	CLAYEY SAND FILL loose, brown and gray, saturated (SC-FILL)
876.8	SANDY SILTY CLAY with Sand medium stiff to stiff, brown and gray mottled, trace sand and gravel (CL-ML) UW = 139.9 pcf SG = 2.63 Sand lenses at 8.5 and 9.5 feet.
875.8	
874.8	LEAN CLAY with Sand very stiff, gray, trace gravel (CL)
873.8	
872.8	
871.8	Sand lens at 13.5 feet.
870.8	
869.8	
868.8	SANDY CLAY stiff to very stiff, trace gravel (CL-SC)
867.8	
866.8	POORLY GRADED SAND fine to medium grained (SP)
865.8	

SAMPLES							PERSONNEL	
Sample No.	Sample Type	Sample Recovery (inches)	Qp (tsf)	N Value (blows/ft)	Moisture Content (%)	PID Reading (ppm)	Geologist - Chris White	Driller - Dave Ellis
225		16	2.25	16	12	0.0	Helper - Justin	Helper -
226		14	1.65	4	17	134		
227		17	1.0	2	17	1500		
228		18	NP	2	20	7.0		
256		24	0.9	ST	12	NA	12" Steel Casing installed to 7 feet. LL = 20, PI = 5 47% Sand 31% Silt 20% Clay	
257		17	2.8	4	11	3.3		
258		15	2.3	2	12	1.4		
259		19	2.1	3	11	1.4		
260		16	2.5	3	11	4.3		
261		21	NP	2	11	1.4		

Project No. 3709.001 County Boone

Boring No. G-16-98 Monitor Well No. \_\_\_\_\_

Project Name Enviro-Chem Superfund Site

Site Location US 421, Zionsville, Indiana

Surface Elevation 884.8 Completion Depth 24.0 ft bgs

Auger Depth 22 ft bgs Rotary Depth ft bgs

Quadrangle Rosston Sec. \_\_\_\_\_ T. \_\_\_\_\_ R. \_\_\_\_\_

Date: Start 2/10/98 Finish 2/13/98

UTM (or State Plane) Coord. N.(X) 921672.8 E.(Y) 725803.5

Water Level: \_\_\_\_\_ During Drilling 18.0 ft bgs At Completion ft bgs

Latitude 39° 57' " Longitude 86° 16' "

Boring Location Southern Concrete Pad Excavation Area

Drilling Equipment and Method CME-75

### DESCRIPTION OF MATERIALS

Elevation 863.8  
862.8  
861.8  
860.8

POORLY GRADED SAND fine to medium grained, gray, trace gravel (SP)

Boring terminated at 24 feet and tremmie grouted with cement-bentonite grout.

Graphic Log

Depth (feet bgs)

### SAMPLES

Sample No.	Sample Type	Sample Recovery (inches)	Op (tsf)	N Value (blows/ft)	Moisture Content (%)	PID Reading (ppm)
262	19	NP	2	3	8	0.4
263	24	NP	1	3	8	2.4

### PERSONNEL

Geologist - Chris White  
Driller - Dave Ellis  
Helper - Justin  
Helper -

### REMARKS

# DRILL LOG

PROJECT ENVIRO-CHEM		OWNER -----		SKETCH MAP  ND - NOT DETECTED  VPPM - VAPOR PARTS PER MILLION  SS - SPLIT SPOON  F - FINE      M - MEDIUM  C - COARSE
LOCATION ZIONSVILLE, IN		W.O. NUMBER 2495-1010		
BORING NUMBER IW-1	TOTAL DEPTH 22.0'	DIAMETER 8.0'		
SURFACE ELEV. ---	WAT LEV: INIT - -	24-HRS -----		
SCREEN: DIA 4"	LENGTH 5'	SLOT SIZE .020		
CASING: DIA 4"	LENGTH 11'	TYPE PVC		
DRILLING COMPANY TOP FLIGHT		DRITILLING METHOD HSA		
DRILLER NICK	LOG BY VFB	DATE DRILLED 3-12-98	NOTES	

Depth (feet)	Graphic Log	Well Construction	Sample Number	Blow Count/ RQD/ % REC.	PID READINGS (VPPM)	DESCRIPTION / SOIL CLASSIFICATION/ (COLOR, TEXTURE, STRUCTURES, MOISTURE, OVA READINGS)
1						0.610 GREY AND BROWN CLAY,
2						LITTLE SILT, TRACE FINE
3					80	TO COARSE SAND, WET,
4						DISTURBED, ODOR PRESENT
5						
6			SS-18	8-15	54	6.0-9.8 GREY CLAY, SOME SILT, TRACE
7				17-32		F-M SAND, TRACE F-M
8			SS-19	9-10	12.5	GRAVEL (WELL ROUNDED), DAMP,
9				13-22		MOTTLED, SLIGHT ODOR
10			SS-20	5-5	20.4	9.8-10.0 BROWN F-M GRAVEL, SATURATED,
11				7-12		SLIGHT ODOR (CHLORINATED SOLVENT)
12			SS-21	3-5	3.0	10.0-12.0 GREY CLAY, SOME SILT,
13				12-23		MOIST, NO ODOR
14			SS-22	6-8	114.7	12.0-12.2 BROWN FINE TO MEDIUM
15				11-12	ND	SAND AND GRAVEL, SATURATED,
16			SS-23	3-4	ND	ODOR (CHLORINATED SOLVENT)
17				7-10		12.2-14.0 GREY CLAY, LITTLE SILT,
18			SS-24	4-5	ND	DAMP, NO ODOR
19				7-9		14.0-14.8 BROWN COARSE SAND, STRONG ODOR
20			SS-25	4-6	ND	( CHLORINATED SOLVENT)
21				9-9		14.8-19.5 GREY CLAY, LITTLE SILT,
22						DAMP, NO ODOR
						19.5-19.6 BROWN FINE SAND, SATURATED, NO ODOR
						19.6-22.0 GREY CLAY, TRACE SILT, DAMP, NO ODOR

# DRILL LOG

PROJECT ENVIRO-CHEM		OWNER _____		SKETCH MAP ND - NOT DETECTED VPPM - VAPOR PARTS PER MILLION SS - SPLIT SPOON F - FINE M - MEDIUM C - COARSE
LOCATION ZIONSVILLE, IN		W.O. NUMBER 2495-1010		
BORING NUMBER IW -4	TOTAL DEPTH 28.00'	DIAMETER 8"		
SURFACE ELEV. ---	WAT LEV: INIT --	24-HRS ---		
SCREEN: DIA 4"	LENGTH 10'	SLOT SIZE .020		
CASING: DIA 4"	LENGTH 17'	TYPE PVC		
DRILLING COMPANY TOP FLIGHT		DRITILLING METHOD HSA		NOTES
DRILLER NICK	LOG BY VFB	DATE DRILLED 3/16/98		

Depth (feet)	Graphic Log	Well Construction	Sample Number	Blow Count/ RQD/ % REC.	PID READINGS (VPPM)	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES, MOISTURE, OVA READINGS)
1						0 - 7.0 GREY BROWN CLAY, LITTLE
2						TO TRACE SILT, TRACE FINE
3					110	TO COARSE SAND, WET,
4						DISTURBED, ODOR PRESENT
5						
6			SS-43	8-11	6	7.0 - 10.0 GREY CLAY, SOME SILT,
7				12-12		TRACE FINE SAND, TRACE
8			SS-44	10-11		M-C GRAVEL, DAMP, NO ODOR
9				14-16		
10			SS-45	6-7	41	10.0 - 10.2 BROWN M-C SAND, SATURATED.,
11				8-14		NO ODOR
12			SS-46	11-12	11	10.2 - 11.8 GREY CLAY, SOME SILT,
13				12-15		TRACE F-C SAND, DAMP, NO ODOR
14			SS-47	6-8	34	11.8 - 12.4 BROWN MEDIUM SAND, SATURATED,
15				12-14		NO ODOR
16			SS-48	5-4	15	12.4 - 13.8 GREY CLAY, SOME SILT, TRACE FINE
17				12-12		SAND, DAMP, NO ODOR
18			SS-49	10-11	15.7,	13.8-14.4 BROWN MEDIUM SAND, SATURATED,
19				12-18		SLIGHT ODOR
20			SS-50	9-10	3.5	14.4 - 15.2 GREY AND BROWN CLAY AND
21				10-11		SILT, TRACE F-C SAND/GRAVEL, DAMP
22			SS-51	3-4	13	15.2-15.6 BROWN MEDIUM SAND, SATURATED.
23				7-12		NO ODOR

**DRILL LOG - IW 4 (continued)**

PROJECT ENVIRO-CHEM		OWNER _____		SKETCH MAP  ND - NOT DETECTED  VPPM - VAPOR PARTS PER MILLION  SS - SPLIT SPOON  F - FINE      M - MEDIUM  C - COARSE
LOCATION ZIONSVILLE, IN		W.O. NUMBER 2495-1010		
BORING NUMBER IW -4	TOTAL DEPTH 28.00"	DIAMETER 8"		
SURFACE ELEV. ---	WAT LEV: INIT --	24-HRS ----		
SCREEN: DIA 4"	LENGTH 10'	SLOT SIZE .020		
CASING: DIA 4"	LENGTH 17'	TYPE PVC		
DRILLING COMPANY TOP FLIGHT		DRITILLING METHOD HSA		
DRILLER NICK	LOG BY VFB	DATE DRILLED 3/16/98	NOTES	

[illegible]



PROJECT NUMBER	BORING NUMBER	SHEET 1 OF 1
	SB-09	
SOIL BORING LOG		

PROJECT ECC LOCATION 25N + 25E of SW corner of P40  
ELEVATION \_\_\_\_\_ DRILLING CONTRACTOR ATEC  
DRILLING METHOD AND EQUIPMENT WELLER SRM AUGER  
WATER LEVEL AND DATE \_\_\_\_\_ START 11-20-39 FINISH 11-2-39 LOGGER BTD

ELEVATION	DEPTH BELOW SURFACE	SAMPLE			STANDARD PENETRATION TEST RESULTS "5-5" (IN)	SOIL DESCRIPTION NAME, GRADATION OR PLASTICITY, PARTICLE SIZE DISTRIBUTION, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOLS LOG	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
		INTERVAL	TYPE AND NUMBER	RECOVERY				
	1		SB-09-01	9"	9-21-16	0 - 0.7' Conc. Pad		HNu bty 2-25 ppm
	2					0-2' fine gravel		
	3		SB-09-02	13"	15-12-10	2-9' coarse gravel fill		HNu up to 250 ppm
	4		(CWP)			reddish brown silty clay w/ gravel		HNu up to 40 ppm
	5		SB-09-03	16"	15-12-10	For. moist.		
	6		SB-09-04	18"	2-2-3	same as above. bottom 6" softer and appears to have more clay		HNu really between 40 + 20 ppm
	7		(CWP)			same as bottom of above.		
	8		SB-09-05	18"	4-7-11	lower portion grades to gray brown with reddish mottles		HNu up to 20 ppm
	9		SB-09-06	18"	6-8-13	med. brown silty clay w/ gravel moist soft. reddish brown mottling		HNu up to 9 ppm
	10		SB-09-07	13"	2-8-9	same as above. lower 10" is equally gray brown and rather brown mottling.		HNu up to 5 ppm
	11					0-8 same as above		
	12					8-12" gray brown silty clay w/ gravel no silty. (spec. not.).		HNu up to 20 ppm

PROJECT NUMBER  
W65230.C3BORING NUMBER  
ECC-10A

SHEET 1 OF 1

## SOIL BORING LOG

PROJECT

ECC RT

LOCATION SOUTH OF FENCE ALONG ROAD

ELEVATION

37.2 from surface

DRILLING CONTRACTOR

ATEC

DRILLING METHOD AND EQUIPMENT

Mobil 3-61 Drill Rig 4" I.D. HSAS

WATER LEVEL AND DATE

START

11/3/84

FINISH

11/3/84

LOGGER J.H. Johnson

ELEVATION	SAMPLE			STANDARD PENETRATION TEST RESULTS 6'-6" (IN)	SOIL DESCRIPTION  NAME, GRADATION OR PLASTICITY, PARTICLE SIZE DISTRIBUTION, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE MINERALOGY, USCS GROUP SYMBOL	SYMBOLIC LOG	COMMENTS  DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION
	DEPTH BELOW SURFACE	INTERVAL	TYPE AND NUMBER	RECOVERY			
2							
4							
6							
8							
10		X	SS-1	12"	4-10-16		
12							
14		X	SS-2	4"	22-47-5 1/3		
16							
18							
20		/	SS-3	9"	8-13-14		
22							
24		X	SS-4	14"	11-26-38		
26							

*SS: Silty*  
*CL: Clay*  
*GC: Gray Clay*  
*GM: Gray Moulded*  
*GS: Gray Sand*  
*MS: Moist*  
*SS-1: Silty Clay, Dark Gray, some sand and fine gravel, silty sand, bottom 4" of sample, moist to wet ~10.5'*  
*SS-2: Sand, light brown, fine, some silty, wet ~16.5'*  
*SS-3: Silty clay, dark gray, some sand and fine gravel, moist*  
*SS-4: Silty clay and clayey silty gray, hard, moist, some sand and gravel. Bottom of boring is 25.0'*  
*HL: reading background (-0.5 ft)*  
*Red clover, possible cobbles and coarse gravel at 15 ft.*

# ENVIRON

650 Dundee Road, Suite 150  
Northbrook, Illinois 60062

## GEOLOGIC DRILL LOG

BOREHOLE NO.: T-9

TOTAL DEPTH: 34.0'

### PROJECT INFORMATION

PROJECT: ECC: Monitoring Wells  
SITE LOCATION: Zionsville, IN  
JOB NO.: 21-6585B  
LOGGED BY: Scott Hayter  
PROJECT MANAGER: Ron Hutchens  
DATES DRILLED: 5-5-98

### DRILLING INFORMATION

DRILLING CO.: EDAC  
DRILLER: Dan Dreyer  
RIG TYPE: Gus Peck GP-1300  
METHOD OF DRILLING: hollow-stem auger  
SAMPLING METHODS: split spoon  
HAMMER WT/DROP 140 lb., 30 in.

### NOTES:

SS INTERVAL (ft)	SS RECOVERY (ft)	BLOW COUNTS	PID (ppm)	DEPTH (ft)	GRAPHIC LOG	USCS	LAYER DEPTH (ft)	SOIL DESCRIPTION
------------------	------------------	-------------	-----------	------------	-------------	------	------------------	------------------

0-10		no sampling						SILT; field observation
10-12	0.5	1, 2, 3, 6	<1			MH		
12-14	0	4, 5, 5, 8	<1				14.0	SILT: Gray-brown silt with a little clay, a little sand, and a trace of gravel. Dry.
14-16	1.5	3, 4, 6, 8	<1					
16-18	1.5	1, 1, 3, 4	<1					
18-20	1.5	1, 1, 3, 4	<1					
20-22	1.1	1, 1, 2, 2	<1			CL		
22-24	1.8	1, 1, 2, 4	<1					
24-26	1.4	1, 1, 3, 4	<1					
26-28	2.0	1, 1, 1, 4	<1				26.7	SAND: Medium to coarse sand with a trace of fine gravel. Dry.
28-30	1.3	1, 1, 1, 4	<1			SW		
30-32	2.0	2, 2, 4, 8	<1					
32-34	2.0	5, 13, 48, 48	<1			MH	33.2	SILT: Dark brown silt with a trace of clay and a trace of fine gravel. Dry.

# ENVIRON

650 Dundee Road, Suite 150  
Northbrook, Illinois 60062

## WELL CONSTRUCTION LOG

MONITORING WELL NO.: T-9

TOTAL DEPTH: 25.5'

### PROJECT INFORMATION

PROJECT: ECC: Monitoring Wells  
SITE LOCATION: Zionsville, IN  
JOB NO.: 21-6585B  
LOGGED BY: Scott Hayter  
DATE(S) DRILLED: 5-11-98

### DRILLING INFORMATION

DRILLING CO.: EDAC  
DRILLER: Dan Dreyer  
RIG TYPE: Gus Peck GP-1300  
METHOD OF DRILLING: hollow-stem auger  
BORE HOLE DIAMETER: California split spoon

T.O.C. ELEVATION: 882.08

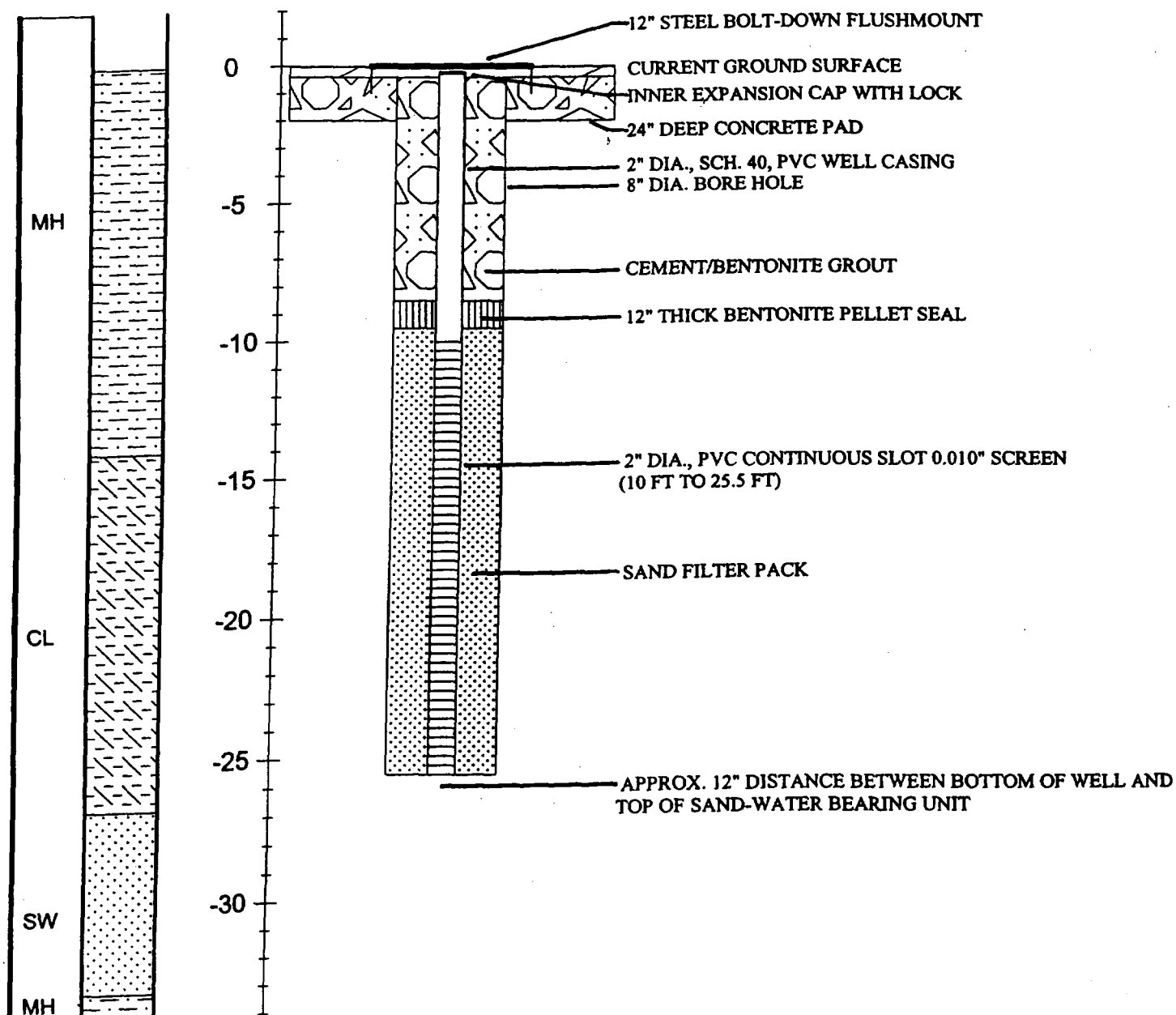
SURVEY COORDINATES: 921571.18N 725827.61E

USCS

GRAPHIC  
LOG

DEPTH (ft)

### WELL CONSTRUCTION



## **APPENDIX C**

### **Diffusion Model**

## Appendix C

### Molecular Diffusion and Decay Transport Model Equations

The following equation describes the change in contaminant concentration over time based on molecular diffusion and decay,

$$\frac{\partial C}{\partial t} = D_{\text{eff}} \frac{\partial^2 C}{\partial x^2} - \lambda C \quad \text{C-1}$$

$$D_{\text{eff}} = D_w \theta_t \quad \text{C-2}$$

where  $C$  is contaminant concentration,  $t$  denotes time,  $D_{\text{eff}}$  is the effective diffusion coefficient,  $x$  is the vertical distance between the contamination and the ground water,  $\lambda$  is the decay constant,  $D_w$  is the chemical-specific diffusivity in water, and  $\theta_t$  is the total porosity. At steady state (i.e., when the diffusive flux no longer changes with time), the solution to the equation is<sup>1</sup>

$$C = C_o \exp\left(-x\left(\frac{\lambda}{D_{\text{eff}}}\right)^{1/2}\right) \quad \text{C-3}$$

where  $C_o$  is the source concentration. The diffusive flux (mass per time per area),  $J$ , into the ground water is, by definition,

$$J = -D_{\text{eff}} \left. \frac{dC}{dx} \right|_{\text{till/water interface}} \quad \text{C-4}$$

<sup>1</sup> Equation was solved by analogy to the heat conduction equation solution presented in Conduction of Heat in Solids. H.S. Carslaw and J.C. Jaeger, Oxford Science Publications, 1959, p. 135.

The expression  $\left. \frac{dC}{dx} \right|_{\text{till/water interface}}$  is the contaminant concentration gradient evaluated at the till/water interface. The rate of mass transfer (mass per time, or M) can then be calculated by multiplying the flux by the area of contamination [length parallel to ground water flow (L) times width perpendicular to ground water flow (W)].

$$M = J \cdot L \cdot W \quad \text{C-5}$$

The contaminant concentration in the underlying ground water resulting from the mixture of the contaminant flux in the ground water can be calculated by dividing the rate of mass transfer by the volumetric flow rate of ground water. The volumetric flow rate of ground water (Q) is represented by the following expression.

$$Q = K \cdot i \cdot W \cdot d_{\text{mix}} \quad \text{C-6}$$

where K is the hydraulic conductivity, i is the hydraulic gradient, and  $d_{\text{mix}}$  is the depth of the mixing zone. The resulting ground water concentration is therefore

$$C_{\text{gw}} = \frac{M}{Q} = - \frac{L D_{\text{eff}} \left. \frac{dC}{dx} \right|_{\text{till/water interface}}}{K \cdot i \cdot d_{\text{mix}}} \quad \text{C-7}$$

An analytical expression for  $\frac{dC}{dx}$  can be obtained by taking the derivative of Equation C-3.

$$\frac{dC}{dx} = -C_o \left( \frac{\lambda}{D_{\text{eff}}} \right)^{1/2} \exp \left( - \left( \frac{\lambda}{D_{\text{eff}}} \right)^{1/2} x \right) \quad \text{C-8}$$

Evaluating this expression at the till/water interface ( $d_{\text{till}}$ ), substituting the resulting expression and rearranging for  $\frac{C_o}{C}$ , which is the effective dilution attenuation factor for diffusion transport ( $\text{DAF}_{\text{dif}}$ ), we get

$$\text{DAF}_{\text{dif}} = \frac{C_o}{C} = \frac{K \cdot i \cdot d_{\text{mix}}}{LD_{\text{eff}} \left( \frac{\lambda}{D_{\text{eff}}} \right)^{1/2} \exp \left( - \left( \frac{\lambda}{D_{\text{eff}}} \right)^{1/2} d_{\text{till}} \right)} \quad \text{C-9}$$

Note that the  $C_o$  in the above expressions refers to the water concentration in equilibrium with the soil concentration, so we must incorporate the equilibrium leaching equation<sup>2</sup> in order to calculate the IDEM RCRA clean closure level for soil ( $C_{\text{soil}}$ ). The resulting expression is

$$C_{\text{soil}} = C_{\text{gw target}} \times \text{DAF}_{\text{dif}} \left[ K_d + \frac{\theta_w + (\theta_a \times H')}{\rho_b} \right] \quad \text{C-10}$$

where  $K_d$  is the product of the chemical-specific organic carbon partitioning coefficient,  $K_{\text{oc}}$ , and the fraction of organic carbon,  $f_{\text{oc}}$ . The chemical-specific input parameters ( $K_{\text{oc}}$ ,  $H'$ ,  $D_w$ , and  $\lambda$ ) used in the Tier 3 calculations are given in Table C-1, along with their respective sources. The site-specific physical parameters ( $f_{\text{oc}}$ ,  $\rho_b$ ,  $\theta_b$ ,  $\theta_a$ ,  $\theta_w$ ,  $d_{\text{till}}$ ,  $L$ ,  $K$ ,  $i$ , and  $d_{\text{mix}}$ ) used, along with the rationale for their selection, are given in Table C-2.

<sup>2</sup> RISC Technical Resource Guidance Document, February 18, 1999, Equation 8-1, p. 8-4.

**Table C-1**  
**Input Parameters – Chemical Specific**  
**ECC Southern Concrete Pad**

Parameters	Units	PCE	1,1 DCA	1,2 DCA	1,1 DCE	cis 1,2 DCE	MC	1,1,1 TCA	1,1,2 TCA	TCE	VC	Source
Target Level for Ground Water <sup>1</sup>	mg/L	0.005	0.99	0.005	0.007	0.07	0.005	0.2	0.005	0.005	0.002	RISC <sup>2</sup>
K <sub>oc</sub>	l/kg	155	31.6	17.4	58.9	35.5	11.7	110	50.1	166	18.6	RISC <sup>2</sup>
H <sup>1</sup>	unitless	0.754	0.23	0.0401	1.07	0.167	0.0898	0.705	0.0374	0.422	1.11	RISC <sup>2</sup>
D <sub>w</sub>	cm <sup>2</sup> /s	8.20E-06	1.05E-05	9.90E-06	1.04E-05	1.13E-05	1.17E-05	8.80E-06	8.80E-06	9.10E-06	1.23E-06	TACO <sup>3</sup>
λ	day <sub>1</sub>	9.60E-04	1.90E-03	1.90E-03	5.30E-03	2.40E-04	1.20E-02	1.30E-03	9.50E-04	4.20E-04	2.40E-04	TACO <sup>3</sup>

<sup>1</sup>Detected as C<sub>gw</sub> target

<sup>2</sup>RISC = RISC Technical Guidance Document, Draft February 1999

<sup>3</sup>TACO = Illinois EPA Tiered Approach to Corrective Action Objectives, Final, July 1997.

PCE = Tetrachlethylene

1,1 DCA = 1,1 - Dichloroethane

1,2 DCA = 1,2 - Dichloroethane

1,1 DCE = 1,1 - Dichloroethylene

cis 1,2 DCE = (cis) 1-2 Dichloroethylene

MC = Methyl Chloride

1,1,1 TCA = 1,1,1 - Trichloroethane

1,1,2 TCA = 1,1,2 - Trichloroethane

TCE = Trichloroethylene

VC = Vinyl Chloride

**Table C-2**  
**Input Parameters – Site Specific**  
**ECC Southern Concrete Pad**

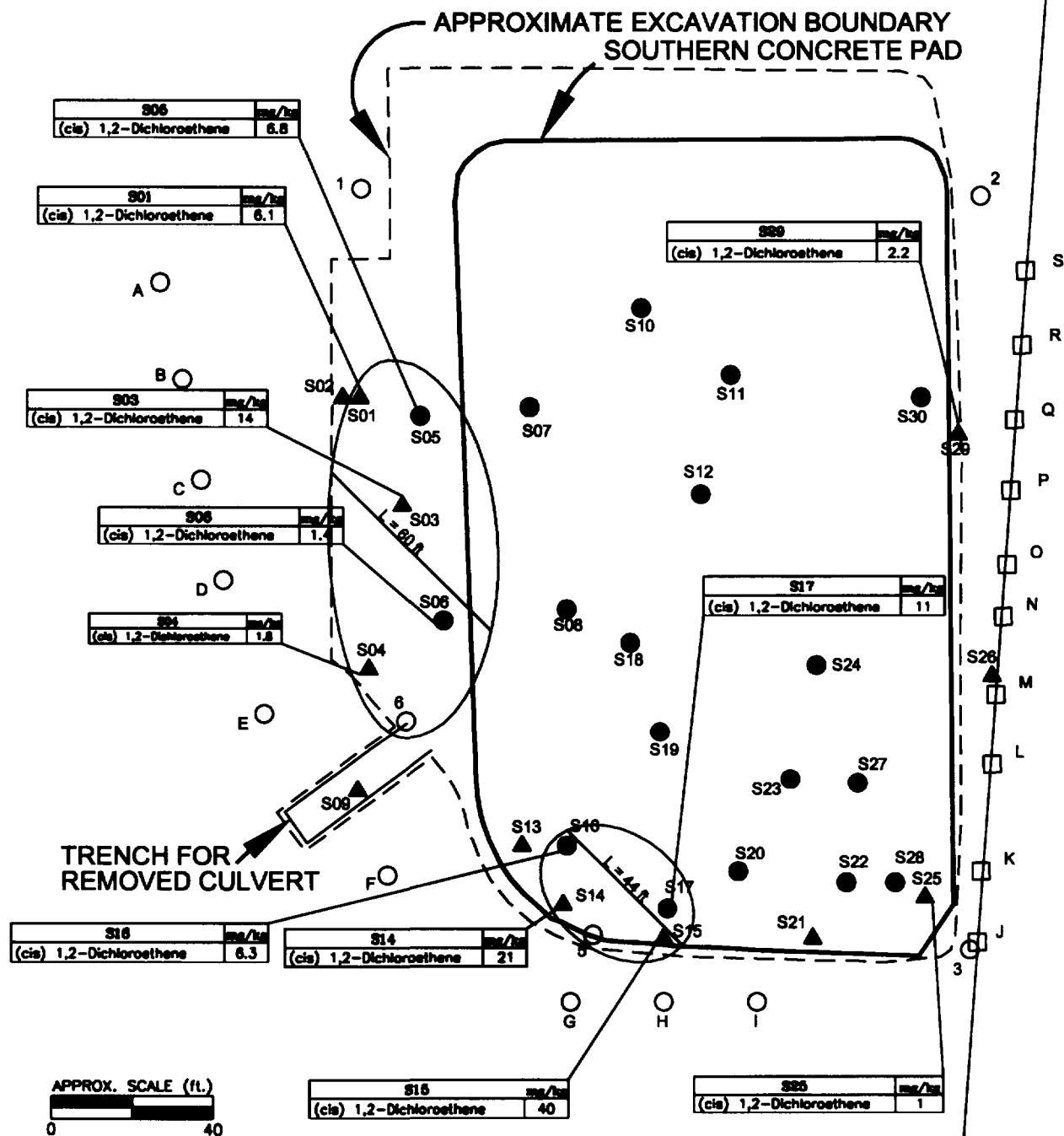
Parameters	Units	Values	Source
$f_{oc}$ - fraction organic carbon	D	0.00964	Total organic carbon data presented in the ERM Technical Memorandum Soil Organic Carbon (January 25, 1996). The average of the foc measurements from the intervals between 4 and 10 feet, excluding B103, B105, and B115 (the obviously impacted borings) was selected.
$P_b$ . Soil Density	kg/l	1.5	RISC Technical Resource Guidance Document, Feb. 18, 1999, p. Ap.1-35
$\theta_t$ - total porosity	g/cm <sup>3</sup>	0.21	Versar soil test data from table dated 2/28/98. The average of all reported measurements was selected.
$\theta_a$ – air filled porosity	D	0.08	Versar soil test data from table dated 2/28/98. The average of all reported measurements was selected.
$\theta_w$ – water filled porosity	D	0.13	Versar soil test data from table dated 2/28/98. The average of all reported measurements was selected.
$d_{till}$ – depth of till	feet	3	Versar Geotechnical Survey Report, dated 4/8/98.
L – length of source area parallel to ground water flow	feet	60	Largest source length for all compounds. The source dimensions were based on area of soil in excess of Tier 1 screening levels for each compound - see Figure C-1.
K – hydraulic conductivity	cm/s	0.006	The lesser of the geomean of the November –December slug test results (0.009 from Table H-1 of the Third Site Field Investigation Data Report) and the geomean of the historic hydraulic conductivity test results (0.005 cm/s from Table 2-1 of the 1988 CH2M Hill Tech Memo) was selected.
i – hydraulic gradient	D	0.004	Based on August 9, 1999 water level observations as reported in the 3/16/00 letter report to Michael McAteer of the USEPA.
$d_{mix}$ – depth of ground water mixing zone	cm	200	ASTM 1939-95 RBCA Standard default.

D = dimensionless

# LEGEND

- EXCAVATION BOTTOM SOIL SAMPLE
- ▲ EXCAVATION SIDEWALL SOIL SAMPLE
- GALV. FENCE POST SURVEY REFERENCE POINT
- 5/8" REBAR SURVEY REFERENCE POINT

**Ground Water Flow Direction**  
(From Fig. 3 of the Second Quarter Surface and Subsurface Water Monitoring Report)



# ENVIRON

650 Dundee Road, Suite 150, Northbrook, IL 60062

**LENGTH OF LARGEST SOURCE**  
**AREA PARALLEL TO**  
**GROUND WATER FLOW**  
**ECC SITE**

**Figure**  
**C-1**

Drafter: JBP

Date: 08/10/00

Contract Number: 21-8585C

Approved: REH

Revised: